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THE MARINE REVIEW

VOL. 36 CLEVELAND OCTOBER 24, 1907. NEW YORK No. 17

MULHOLLAND HATCH FASTENER

(LIMITED)

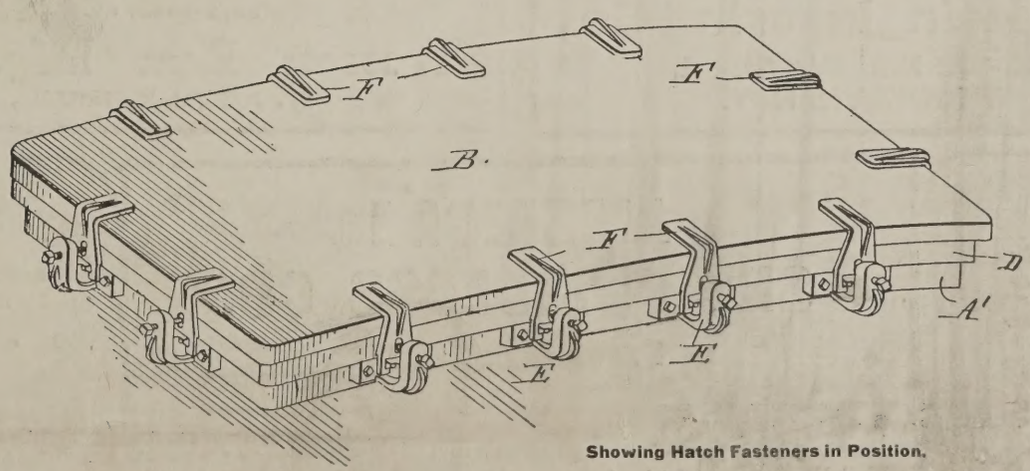
¶ This fastener secures with one grip and in one operation the hatch cover, tarpaulin and batten.

¶ It has held hatch coamings and hatch covers together in storms that have torn the deck itself off the vessel.

¶ It can be applied to steel hatches as well as to wooden ones.

¶ With the Mulholland Fasteners vessel masters will have no cause to worry from loosened hatches.

Samples furnished upon application



Showing Hatch Fasteners in Position.

M. Mulholland

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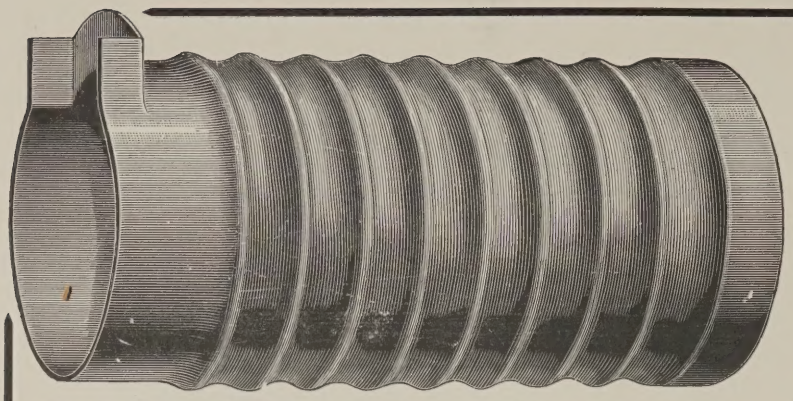

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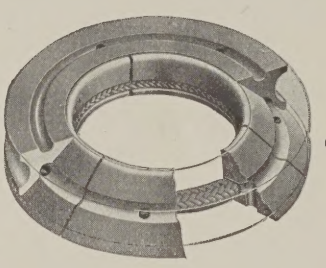

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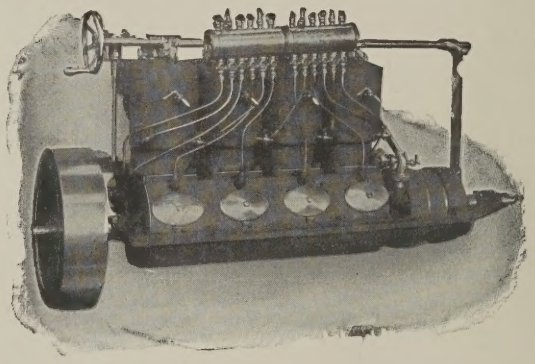

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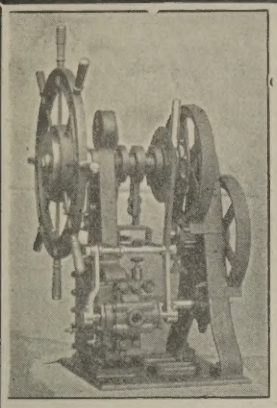

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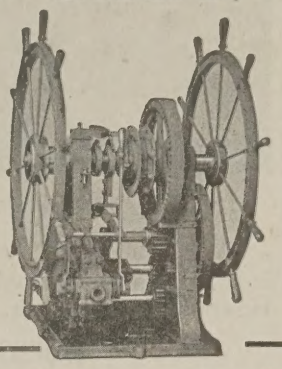

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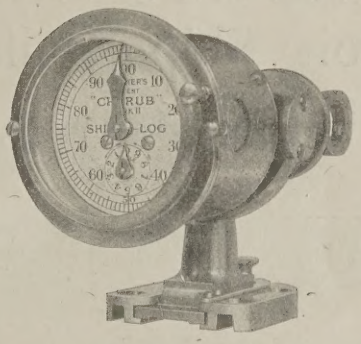

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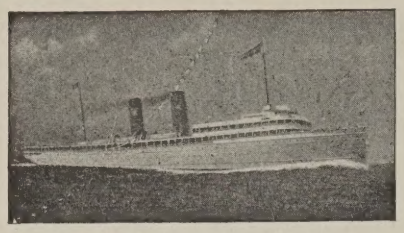

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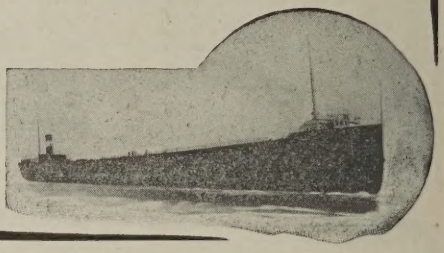

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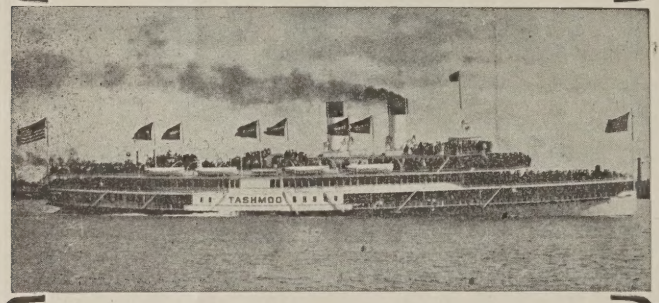

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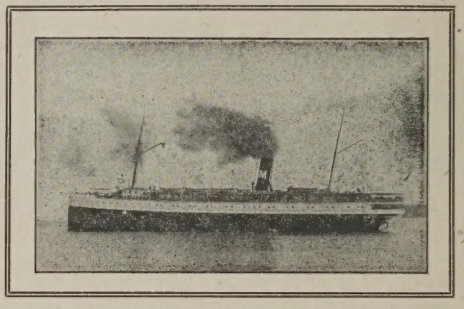

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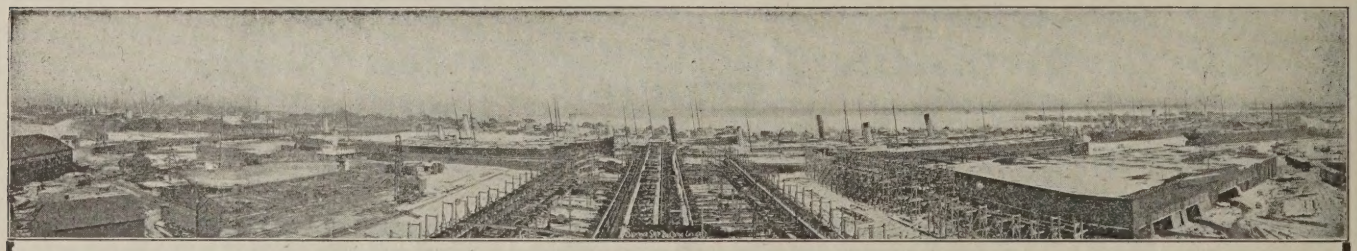

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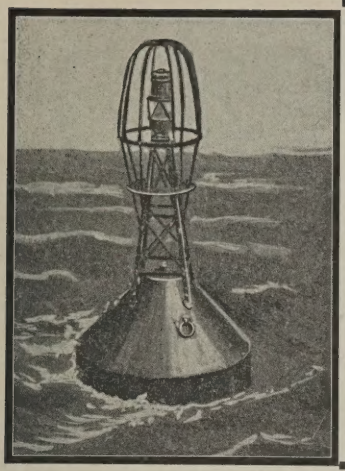

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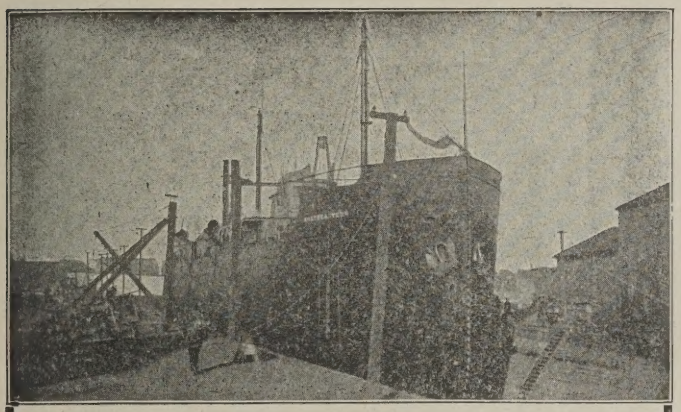

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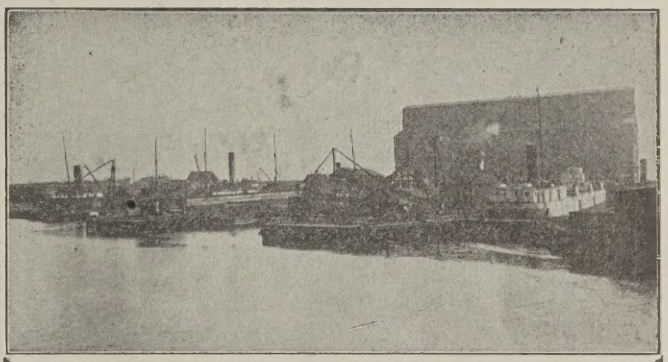

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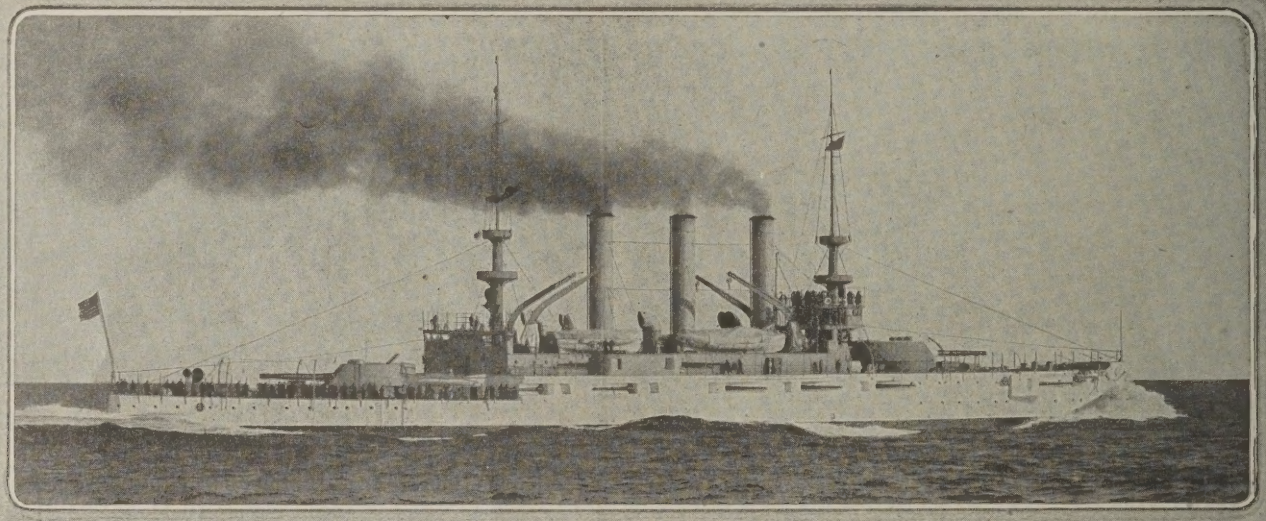

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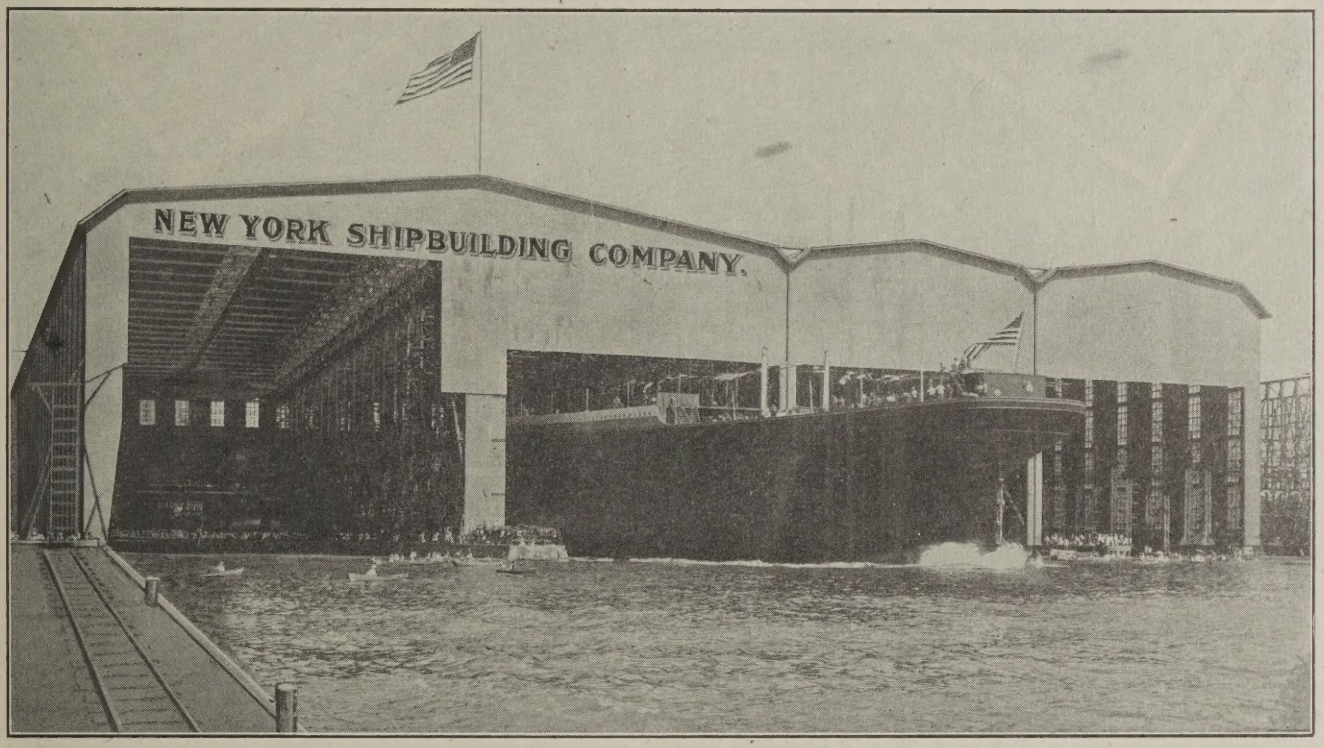

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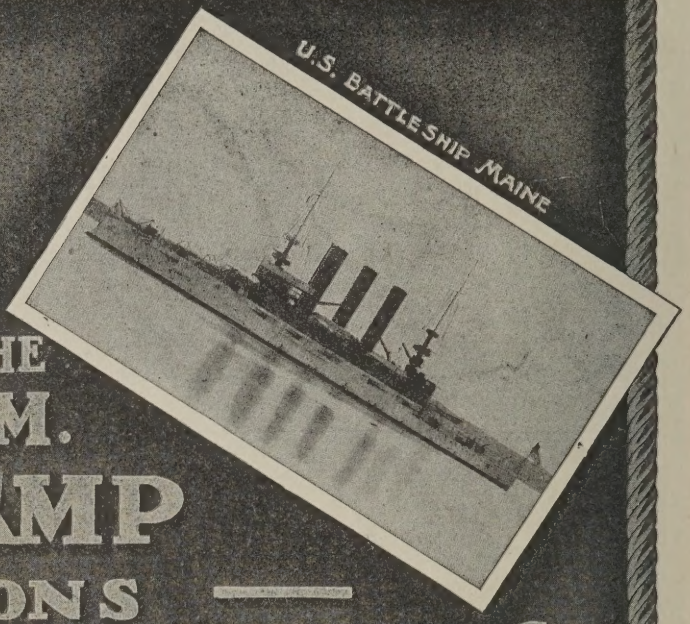

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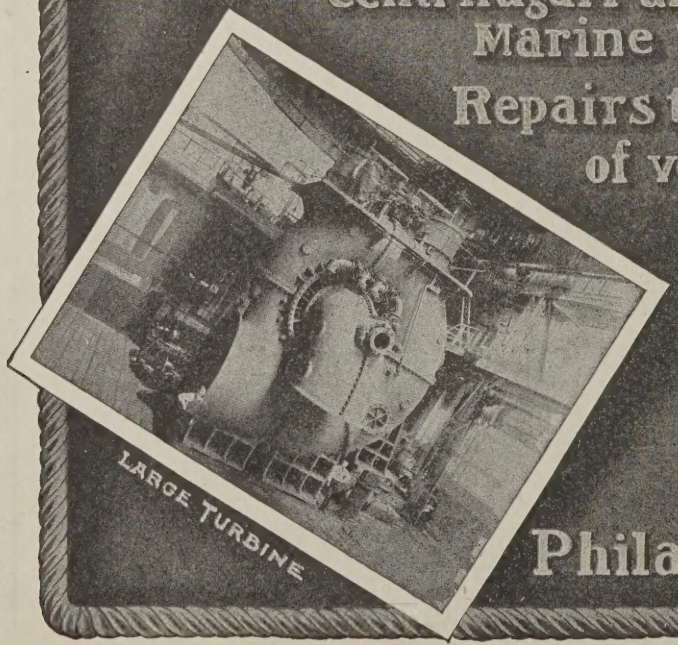

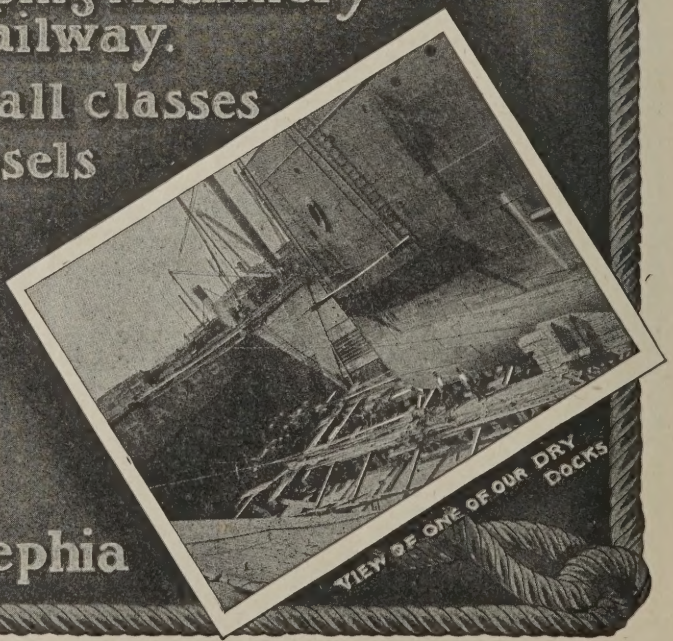

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JAN 4 1907

THE MARINE REVIEW

VOL. 36. CLEVELAND, OCTOBER 24, 1907. NEW YORK No. 17

THE TURBINE AND GERMAN LINES.

The German lines are by no means convinced that the turbine is the best form of steamer for oversea purposes. Director Wiegand of the North German Lloyd says that the Lusitania's victory is not to be attributed to the fact that she has turbines but that she has such high horsepower—70,000.

The director continues: "The Lusitania's turbines, with their relatively small number of revolutions, should not run more economically, to say the least, than a good triple or quadruple-expansion steam engine. The economic value of the turbine lies chiefly in its high revolutions and the satisfactory utilization of steam thus secured. The rapid revolution of the propellers, however, means a reduction of their efficiency. In order to make the propellers revolve at the speed which renders them most effective, it is necessary to reduce the speed of the turbine to a point where it no longer operates economically. After many years' experience it has been found that the propellers of the North-German Lloyd's express steamers work most economically at about 80 revolutions per minute, whereas the Lusitania's screws have 180 revolutions. For this reason I do not believe that the Lusitania's machinery plant represents an advantage over the prevalent type. In other words, if I build a ship of the same dimensions and put into it an equal power in the form of reciprocating engines, the effective result will in all probability be the same, if not superior to the turbine-equipped steamer. One disadvantage of the turbine steamer is that it possesses inferior maneuvering capacity, because all the steam at hand cannot be used for backing.

"Another question arises: What practical advantage is it to increase the speed of steamers in the North Atlantic traffic to 24 or 25 knots per hour? I am of the opinion that the advantage is just about equal to zero. With our present speed of 22 to 23 knots we arrive at New York by day, whereas we should arrive at night if our steamers should make 24 or 25 knots. Precisely for this reason it was that we brought our express steamers up to 22 and 23 knots. It is well known that we refused to accept the Kaiser Friedrich several years ago because it did not make contract time and would land in New York at night. To bring us any practical advantage in this respect, therefore, the speed of a steamer must not stop with 24 or 25 knots, but would have to make 25½ to 26 knots. That is a circumstance which is not sufficiently taken account of in Germany. We are under obligations to call at Southampton and Cherbourg within certain hours in order to make connections with the trains for London and Paris, and must accordingly stop our steamers at the usual hours, and we could not equalize matters (in case very fast steamers were used) by postponing the sailings for several hours."

Director Wiegand concludes that if the Lloyd should increase the speed of its steamers to 24½ knots their operation would be less economical, since the vessels themselves would cost more, consume more coal, and besides all this would arrive in New York at night, after which they would be compelled to lie at their docks till the regular time for sailing, thus counterbalancing any advantage from greater speed. "Of course," he adds, "if we increase their speed to above 25 knots they would arrive at comfortable hours, but the cost of such a steamer of about $7,500,000, along with the vastly increased expense of operation, would be out of all proportion, economically, to the saving of time at sea. Such a saving would not present a strong enough attraction for the general public to make them willing to pay the increased price of tickets. Hence, as our company is dependent upon its own resources (instead of subsidies) it could not get any business advantage from putting on such fast steamers."

The report that the vibration on the Lusitania is considerably greater than on the fast German steamers has been looked upon here as an additional reason for the German lines to adhere to the old type of engine. Owing in part to that increased vibration the Germans think that this steamer and the Mauretania will not prove dangerous competitors for the first-class passenger traffic between Europe and New York. Only when they make much faster time than the Lusitania did on her maiden voyage could they become dangerous rivals; but then the vibration would increase still more annoyingly, so as to neutralize the attraction of quick time; for comfort is, after all, the chief thing desired by the ocean traveler, and a day more or less at sea cuts a very slight figure with everybody except a few hurried business men.

PROSPECTS OF THE RATE WAR.

The German companies do not look upon the Lusitania as the cause of the rate war that has broken out in the passenger traffic on the North Atlantic lines. It is said here that this fight would have come quite independently of the Cunard's new accession of fast steamers; and it has been expected for some time and in part even prepared for. The annual report of the Hamburg-Amerika line for 1906 referred to the probability that such a struggle might begin at any time, and it explained the large

write-off shown in the annual balance-sheet as a provision made precisely for this eventuality. This was done, not because Director Ballin desired to make war upon English lines, but because he recognized the fact that the peace patched up three or four years ago was not a satisfactory arrangement and was likely to break down. He stoutly denied several weeks ago, when the first reductions in passenger rates were announced, that a rate war had begun; but the numerous cuts in the prices of tickets published since then have rendered it impossible longer to make it appear as if all were harmonious between the competing lines.

The earlier rate reductions were regarded with much seriousness by the financial community, and the shares of the two great Hamburg and Bremen lines were sold down pretty sharply in consequence. The more recent reductions, strangely enough, have been treated as far less serious from the speculative standpoint; and shares have refused to yield further ground. The stock operators evidently have come to the conclusion that the German lines are well equipped financially for the struggle that has begun, and that they will come out at the end without damage to their position. It is highly probable, too, that the people on the stock exchanges are speculating upon the calculation that the rate war will eventually lead to a more satisfactory agreement between the great international lines in regard to passenger rates, and one that will prove more or less permanent. It is known that this is the goal aimed at by Director Ballin, and Bourse traders believe that he will succeed in making it.

SHIP OWNERS' APPRENTICE SYSTEM.

The Shipowners' Association of the Pacific Coast is undertaking upon its own initiative a system of apprenticeship and has received the promise of support from a number of owners and the assurance from many young men that they will go out as apprentices under the agreement. The Shipowners' Association of the Pacific Coast, whose offices are in the Ferry postoffice building, San Francisco, are projecting this form of apprenticeship partly for patriotic reasons to the end that an opening may be made to the youth of this country of obtaining a seafaring training tending to the betterment of the American merchant marine and a school for American officers. The officers of all the different departments aboard ship are strongly urged to recruit in the apprentice service their own boys as well as those of relatives and friends. The apprentice will rate at the end of the third year as a petty officer. He will be instructed in seamanship and navigation, to receive and deliver cargo, stow and secure cargo, running the winches and capstans, the making and taking in of sails, writing the log, heaving the lead, steering by compass, knotting and splicing, use of palm and needle, the opening and unbinding of sails, signals, use of boats, etc. The pay will be $20 per month for the first year, $30 per month for the second year and $40 per month for the third year, with a bonus of $250 for good service and behavior.

SHIP BUILDING IN THE UNITED KINGDOM.

From the returns compiled by *Lloyds Register of Shipment,* it appears that, excluding warships, there were 450 vessels of 1,080,087 tons gross under construction in the United Kingdom at the close of the quarter ended Sept. 30, 1907. The particulars of the vessels in question are as follows, similar details being given for the corresponding period in 1906 for the purpose of comparison:

	Sept. 30, 1907.		Sept. 30, 1906.	
Description.	No.	Gross Tonnage	No.	Gross Tonnage.
Steam.				
Steel	417	1,068,271	477	1,253,031
Iron	..	.....	1	500
Wood and composite	2	151	..	.....
Total	419	1,068,422	478	1,253,531
Sail.				
Steel	17	10,484	20	9,836
Iron	..	.....	..	.....
Wood and composite	14	1,181	14	1,400
Total	31	11,665	34	11,236
Total steam and sail	450	1,080,087	512	1,264,767

The tonnage now under construction is 170,000 tons less than that which was in hand at the end of last quarter, and nearly 185,000 tons less than that building twelve months ago.

Of the vessels under construction in the United Kingdom at the end of September, 356 of 790,472 tons are under the supervision of the surveyors of *Lloyds Register* with a view to classification by this society. In addition, 59 vessels of 172,070 tons are building abroad with a view to classification. The total building at the present time under the supervison of *Lloyds Register* is, thus, 415 vessels of 962,542 tons.

SHOULD HELP OUR MERCHANT MARINE

The following communication to the *Brooklyn Eagle* is of interest:

I agree with Admiral Dewey that we should never give up the Philippine Islands. England, Germany or Japan want them. If these countries consider the islands good for them to own, I guess they are good for the United States to hold on to. We are spending $300,000,000 building the Panama Canal as a short cut to our Pacific coast states, and the Philippines will come in handy for naval and coaling stations, and will increase our export trade with the far east.

Mr. Seaver, in a letter to the *Eagle,* says there should be free trade between the islands and the United States. The islands do export hemp free of duty to the states and a reduced rate of duty on Manilla sugar. In time to come there will be further reductions. He should not expect the reduction to be so large as to injure the cane sugar industry of the southern states or the beet industry of our western states.

Protection is the settled policy of the United States. We had a revision of the tariff or a freer trade bill, known as the Wilson-Gorman bill. Under it the farmers of the west had corn to burn, and President Cleveland had to put the country in pawn to raise money to pay the current expenses of government. In 1897, we had another revision of the tariff to bring about freer trade between foreign countries and the United States, known as the Dingley bill. Under this bill the farmers of the west had money to burn and have been burning it ever since. Under this bill 95 per cent of the products of this country are consumed here and only 5 per cent are exported, yet that 5 per cent is greater than the exports of any other country, all carried for us in vessels built in free trade countries—England 75 per cent and Germany and Norway the balance.

This country does not protect the American ship builder, but confines protection to the farmer and the manufacturer In 1861 the American ship builder did not need protection, as 66 per cent of our foreign carrying trade was done in American built ships in those days. As the country prospered under protection wages increased, cost of material also, and the American ship builder had to confine himself to coastwise ship building. So today our American built ships engaged in foreign trade has fallen to 10 per cent.

A British cheap labor built vessel can be built 50 per cent cheaper and

manned and maintained 50 per cent less than in this country. Protecting the farmer and manufacturer has ruined the ship builders, and today the country is paying $200,000,000 a year to foreign ship owners for carrying our goods. The farmer has had millions of dollars spent in irrigation of bad lands of the west and hundreds of thousands of dollars for free seeds. The American manufacturers own shares in foreign built ships for cheap freight rates.

As an act of simple justice a ship subsidy bill should become a law. Robert Fulton built the first steam vessel to ply the water. Stephenson, of England, built the first locomotive. We are protected against the cheap labor built locomotives of England, and today we supply a population of 85,000,000 and supply foreign countries with our surplus locomotives. Having no protection against cheap labor built foreign vessels, we have no merchant marine. In 1902 we built 408 automobiles; in 1906 we built 58,000; France, 55,000; England, 20,000; Germany, 15,000. We have the most skilled and best paid labor in the world. We are building the best navy in the world. When our sailors serve their time we want an American merchant marine to put them in. We have unlimited coal and iron and there should be no reason for the sixtieth congress refusing to restore our merchant marine.

Secretary of State Root made a trip to South America looking for new business for the products of the farmer and manufacturer, and the interests of American built ships to carry the goods. He was Uncle Sam's advance salesman. I hope he will be running the shop in Washington on March 4, 1909.

PROTECTIONIST.

Brooklyn, Oct. 7, 1907.

RUNNING OCEAN STEAMSHIPS BY WIRELESS.

Editor MARINE REVIEW:—It was recently stated by the Hon. Hugh Bell, the eminent authority on electricity, that a century hence, Niagara Falls will furnish the power to run ocean steamships by wireless current. What a consolation to know that some day there is a possibility of there being an American merchant marine service. This, of course, providing that the "favored nation clause" "a la German agreement," does not compel the United States of North America to furnish the German republic merchant marine with the current free of cost.

JOHN B. HARDY.

New York, Oct. 9.

THE STRUCTURAL DETAILS OF CARGO STEAMERS IN RELATION TO THEIR WATER BALLAST ARRANGEMENTS*

BY SAMUEL J. P. THEARLE.

Water-ballast was first carried in screw-colliers trading between the Tyne and the Thames. The old sailing colliers were ballasted with Thames gravel for the voyage northward, and this was put ashore on Tyneside before the coal cargo was loaded. The cost of loading and discharging this ballast was a heavy charge on the freights earned by the vessel.

The earliest steam-colliers were ballasted in a similar manner, but it at length occurred to an ingenious person that water was superior to gravel as a ballasting material, because it might be made to flow into and out of a vessel, instead of being carried in baskets. And so tanks were built in the bottom of the steamer, into which water was admitted for ballasting, and out of which it could be pumped when no longer required. Very soon these tanks became an integral part of the structure, and thence originated the McIntyre tank.

The structural details of the McIntyre tank are well known. They consist of longitudinal girders standing upon the floors of the steamer, supporting an inner bottom which is attached to the outer bottom of the vessel by a flanged margin-plate on each side. To these margin-plates the side framing of the vessel is attached by angles riveted to brackets on the frame-heels. In the earliest screw-colliers fitted with double bottoms the frames passed continuously through the margin-plate, and the latter was made water-tight by means of collars or some other device. The chief and characteristic structural feature of the McIntyre tank is, however, the bracket attachment of the frames to the flanged margin-plate.

It should here be noticed that the inner bottom plating, longitudinal girders and margin-plates, takes the place of the centre and side keelsons previously required in such vessels. The net result is an increase in the structural strength of the bottom of the vessel and an additional weight of materials used in her contruction. At the same time an element of safety is introduced in the form of an inner bottom, and a great saving is effected in the cost of ballasting the vessel and in the time occupied in getting the ballast into and out of her.

A proximate step consisted in the adoption of the cellular system of double-bottom construction. In this arrangement the normal floors were replaced by floors extending the full depth from outer to inner bottom, and the numerous longitudinal girders standing on the floors were replaced by a centre continuous girder and by one of or more side girders. The arrangement of margin-plate remained the same as in the McIntyre tank. Two systems of cellular double bottom are adopted, in one of which floors are spaced at every frame, and in the other at alternate frames, the side girders being much more closely spaced in the latter than in the former arrangement.

The Board of Trade ultimately sanctioned the omission of the whole of the double bottom space in measuring the vessel for tonnage, and this concession gave a great impetus to the system, which at the present day is adopted in all but the smallest of cargo-steamers. The depth of the double bottom at the middle line, although fixed by Registry Society Rules, seems to be actually governed rather by water-ballast carrying requirements than by the necessities of structural strength. The minimum breadth of margin-plate is, however, limited by the necessity for obtaining a sufficient rivet attachment of the brackets at the frame-heels to maintain a continuity of transverse strength.

It is submitted for the consideration of this meeting whether the structural strength of cellular double bottoms in cargo-holds is not usually somewhat in excess of actual requirements. Under boilers the wasting of steel plates and angles of the double bottom goes on at a very rapid rate, and an excess of scantlings at that part is therefore desirable in a new steamer in order to avoid the necessity of early renewals. But under cargo-holds the rate of wasting is not considerable, nor is it believed to be in excess of that experienced on the outer bottom and sides of a vessel.

Various measures have been suggested and tried for reducing the rate of wasting in double bottoms under boilers. Different paints, bituminous compositions, and lime and cement washes have their several advocates. Some have proposed means for minimizing the rate of corrosion by ventilation, and others have sought to obtain that result by keeping a low temperature in the space under the boilers. It is thought that a discussion on this important question might

*Paper read at the Engineering Conference of the Institution of Civil Engineers.

properly come within the scope of the title of this paper.

For some years past cold flanging has been largely adopted in lieu of angle attachments in double bottoms of steamers. Floor-plates have been flanged at their upper and lower edges, and intercostal plates have been sometimes flanged against the floors and sometimes flanged on their upper and lower egdes. It is generally admitted that recourse to flanging involves the necessity for the best workmanship and the most closely-fitting surfaces. It is also generally recognized that flanging does not provide the same rigidity of connection as an angle-bar. But it is believed by many that the association of flanged materials, as in the structure of a cellular double bottom, does produce under proper conditions an efficient combination, and one that is suitable for resisting the stresses coming upon it, either afloat or on well-laid blocks in a dry dock. It is, however, not so generally conceded that flanged floors are so well able to resist the stresses resulting from grounding or stranding as floors riveted to frames and reverse frames. This is an important question, and attention to it is now invited.

Vessels fitted with cellular double bottoms usually have after-peak ballast-tanks for trimming purposes, and some have fore-peak ballast-tanks also. In each case, valuable use is thereby made of a space which can be employed for but a few other purposes. Certain precautions are, however, found necessary in view of the fact that these peaks are sometimes only partly filled with water. It need hardly be remarked that when at sea they should always be either quite full or quite empty. If quite full, the stresses due to the water-pressure within the tank are about balanced by those due to the water-pressure on the outside. If quite empty, the stresses upon the shell-plating and framing are no greater than those ordinarily experienced elsewhere on the immersed portion of the hull. But when the peaks are only partially full of water, the violent movements of the vessel in a seaway set up stresses of a destructive character. To minimize the results of these, deep wash-plates should be fitted, and these should be efficiently secured. It is further desirable that the rivets through the frames and shell-plating should be more closely spaced than elsewhere in the sides and bottom of the vessel. Even with such precautions, damaging stresses result from peak ballast-tanks being only partly full of water when at sea.

It has of late years been usual to fit midship deep tanks in cargo-steamers, in order to obtain the necessary immersion when the vessels are in ballast trim. Such deep ballast-tanks sometimes contain upwards of 1,000 tons of water. If they are kept full of water, the stresses upon the materials of which the tanks are built are such as may easily be provider for; but if only partly full when at sea, then, having regard to the much greater breadth of the vessel where the tanks are situated than at her extremities, the violent motion of the free water is even more damaging than in the peaks.

In order to reduce the longitudinal movement it has been usual to keep the length of an individual tank within moderate limits, and in cases where, say, 2,000 tons of water have to be carried in that way, to build two tanks rather than only one. Also, to moderate the effect of transverse movement, it has been usual to fit a longitudinal middle-line bulkhead in the tank, extending from the top to the bottom. It has also been usual to additionally strengthen the sides of the vessel by web frames in way of deep tanks. The rivets through frames and shell have been more closely spaced than elsewhere in the vessel, except the peaks; and, of course, the transverse bulkheads bounding the deep tanks have been very thoroughly stiffened.

Cargo is carried in these deep tanks when they are not used for water-ballasting purposes; and consequently there has always been a natural desire to break the stowage as little as possible inside the tank, and to make the work of getting the cargo in and out of it as simple as possible. In order to effect this, the middle-line longitudinal bulkhead has in some cases been omitted, and there is a growing desire to dispense with it altogether. Were all men trustworthy, so that it might be definitely ensured that a deep tank would always be completely filled with water when at sea, the omission of the longitudinal partition bulkhead would not be a matter of much moment, and the loss of stiffening to the transverse bulkheads resulting from the omission could be easily supplied in some other way. But in view of what experience shows to be a not unusual treatment of ballast-tanks at sea, it is submitted that the fiitting of the middle-line longitudinal bulkhead is so desirable as to override any objection to it arising from inconvenience or broken stowage.

When deep tanks are not fitted in a steamer, and when the weight of the water carried in the after-peak tank is not sufficient, acting in conjunction with the other water ballasting, to give the necessary immersion to the screw propeller, it has been usual to supplement water with shingle or gravel, ballast carried on deck and thrown overboard on entering the loading port. To save the expense of taking this shingle ballast, or of building a deep tank in the steamer, some owners have authorized the masters of their vessels to admit water into the after-hold, by taking off some manhole covers from the inner bottom, and then opening the sea-cock until a sufficient quantity of water is admitted for obtaining the desired immersion of the screw-propeller. It has not been usual for the water admitted to extend above the top of the shaft tunnel, which latter thereby serves a useful purpose in partially checking the movement of the water due to the rolling of the vessel. Even with that limitation, the movement of such a body of free water has caused damage by washing up ceiling and sparring, and reducing them to pulp; and it cannot be doubted that the structure of the vessel might also be damaged under such conditions. It may be conceded that at a time of peril, with a vessel near a lee-shore and the propeller insufficiently immersed to get her into a position of safety, it might be allowable to choose the less of two evils, and admit free water into an after-hold in order to obtain the desired deeper immersion But a course which might be resorted to in order to save life and property should not be adopted as a normal condition of navigation in ballast, when attended with such evil consequences as are found to occur in this instance.

Of late some very valuable arrangements, both from a structural as well as from a navigator's or a shipowner's point of view, have been introduced into cargo-steamers. One of these is the Dixon and Harroway system of wing tanks for carrying water-ballast, and another is known as McGlashan's side-tank system. The figures on the walls show the two arrangements, which it is thought are well worthy of consideration. A primary object in both systems is to carry water-ballast at a higher level in the vessel than is possible in the ordinary double bottom, and so reduce the stability, which is often excessive in the modern-broad and shallow steamer when in ballast trim. Other important objects are also served. In both cases the tonnage meaurement is reduced by the arrangement from what it otherwise would be; and as such vessels are intended for carrying dead-weight cargoes, the available hold-space is amply sufficient for their owner's purposes. Dixon and Harroway's arrangement serves also the purpose of self-trimming, and both it and McGlashan's system add materially to the structural strength of the vessel.

As regards the Dixon and Harroway arrangement, it will be evident that with a reasonable spacing of transverse bulkheads, giving holds of not immoderate length, the fore-and-aft girders formed by the wing tanks and continuous hatch-coamings enable pillar suports to be dispensed with. This is a valuable feature in a cargo-steamer.

The element of safety in case of collision, resulting from the inner skin-plating of the McGlashan side ballast-tanks, and from the wing compartments of the Harroway and Dixon arrangement, will also be evident.

Plans have been prepared for carrying water-ballast in enclosed spaces upon the upper decks of steamers between the hatchways. Other proposals have been made for carrying water in the 'tween decks, confined within compartments bulkheaded off for the purpose, and made available for cargo-carrying by having hatches fitted to them. Neitner of these arrangements has, however, found favour among shipowners. It will be evident that each would involve very considerable pillaring supports being placed beneath them.

It is submitted that a water-ballast-carrying arrangement in a steamer should serve the purpose of contributing both to her structural strength and to her safety at sea. The spaces devoted to water-ballast should also be of such a character that they would not be included in the tonnage measurment of the vessel, except when used for carrying cargo. They should be readily and freely accessible for examination, cleaning, and re-coating, and should be so proportioned and situated that the water within them will not detract seriously from the vessel's stability while the spaces are in course of being filled or emptied, nor unduly add to the vessel's stability when full. They should further be so constructed and fitted as to minimize the stresses set up within them, in the possible event of their being not quite filled when the vessel is rolling or pitching in a seaway; and they should be so situated in the vessel as not to set up undue stresses upon the structure when she is in a ballasted condition.

It is further submitted that if all these requirements could be satisfied without the hull of the vessel being any heavier than would have been the case had no water-ballast accommodation been provided, then, in such circumstances, an ideal arrangement would have been arrived at.

OVERHAULING WHEEL CHAINS.

Editor MARINE REVIEW:—Month to month we cannot but be struck with the percentage of numbers of mishaps to our lake fleet of vessels, owing to rudder gear out of order, or, worse still, chains parting or getting jammed; all sailors know what that means, in dirty weather, at night, or even in daylight. When I was an executive officer, lake water or ocean, I never failed to see my steering gear frequently overhauled, and at least several times a day the nips, or those parts that are continually working round the leads, greased; this should be the wheelsman's duty. Then again, masters of vessels should not be content to rely on others when taking charge, either at the beginning of the season, or during the season, but at least once a month after vessel has started season trip, to have chains and leads and pins of leads thoroughly overhauled and looked at; attention to this matter should be enforced, and we must always remember, even if matters are found all right, it is a satisfaction to know they are, and if a mishap should happen, which will in the best regulated ships, if the master can say he had attended to such matters, and others, it would help him.

I would also suggest that owners or managers should have such matters reported to them, and a record kept. We must not say we know all this and condemn the idea, for even this reminder may help some and it enforces the importance of such in their minds.

Remember in some vessels, a craft when at anchor, or laying at a wharf, friction is going on all the time as long as the vessel is afloat in clear water, rough or smooth.

Remember such matters as the above has cost the loss of life, loss of your vessel, and a large amount of dollars.

CAPT. GEO. F. COLES.

Collingwood, Ont., Oct. 15.

MISCELLANEOUS ITEMS.

The fifteenth annual meeting of the Society of Naval Architects and Marine Engineers will be held in the Engineering Societies Building, Thursday and Friday, Nov. 21 and 22. An excellent program of about fifteen papers is expected.

A. Drewell & Co., Kobe, Japan, have sold the Canadian Pacific Railroad Company's steamers Athenian and Tartar to a Japanese client. The Athenian was delivered on Sept. 14 and the Tartar is to be delivered on her next arrival from Vancouver in November.

Mr. Charles M. Schwab, owner of the plant of the Union Iron Works through the Bethlehem Steel Co., has at the suggestion of President Roosevelt gone to San Franscisco to personally put the plant in shape for taking care of the Pacific squadron when it reaches him. The squadron will doubtless be in need of extensive repairs after its long voyage.

The new boat built at Belfast for the White Star liner Suevic, was launched Oct. 5. The Suevic, as will be remembered, was wrecked off the Lizard early in the year, and the salvers were unable to save the forward part of the ship, although the after half of the vessel was practically uninjured. This part of the vessel is now in dry dock at Southampton awaiting the arrival of the new bow from Belfast, which, by the way, is considerably longer than the old one, and when the two pieces of the ship are put together the vessel will not only be as good as new but will have the added advantage of increased capacity.

The navy department is reported to be considering the question of offering free transportation to eastern workmen and their families, in order to induce them to go to the Pacific coast to effect the repairs which will be necessary to the battleship fleet while in those waters. The arrangement would be contingent upon an agreement by the workmen to remain in the service of the government for a certain time after arriving on the coast. Of course it will be necessary to agree to a higher scale of wages than is prevalent on the Atlantic seaboard, to conform to the standard of the Pacific coast.

As the outgrowth of the breaks in the Erie canal at Syracuse recently and the consequent delay in the repairs which was the cause of immense losses by the shipping interests using the canal, it is authoritatively stated that the canal boatmen and the shippers and receivers of freight are to demand the removal from office of Frederick C. Stevens, superintendent of public works of the state of New York, and who is responsible for the care and maintenance of the Erie canal as well as for the construction of the 1,000-ton barge canal. That it took two months to repair the first break and that immediately upon the completion of the repairs there was a second one in the same locality, is argued as showing incompetency, inasmuch as there had never previously been a break which put the canal out of commission for more than 13 days.

In spite of the fact that the opinion prevailing in the public mind is that the square-rigged merchantman has become nearly extinct, the port of Boston hastens to assert that there are many of this class of picturesque vessels trading to and from there, the majority of the vessels being British, Norwegian and Italian. Although the tramp steamer has cut into the monopoly of the lumber carrying trade between Canada and Europe, former-

ly enjoyed by the Norwegian square rigger, hundreds of their barks are seen there every summer, and they have also bought steamers with which to compete with their rivals. The Russians, Swedes and Danes, as well as the Portuguese, have large fleets of full rigged ships and barks, which are occasionally represented by a caller at an American port. At one time Bath and other Maine ports and St. Johns, N. B., had large fleets of full rigged ships, but nearly all have disappeared, having been sold to foreigners or converted into barges, scows, etc. The Bath ships included some of the largest in the world and are recalled with pleasure by the older generation of the sailing fraternity.

SUMMARY OF NAVAL CONSTRUCTION.

The monthly summary of naval construction, issued by the bureau of construction and repair, shows the following progress upon vessels:

Name of Vessel.	Building at—	—1907— Per cent of completion. Sept. 1.	Oct. 1.
BATTLESHIPS.			
Mississippi	Wm. Cramp & Sons	91.97	94.96
Idaho	Wm. Cramp & Sons	86.01	87.54
New Hampshire	New York S. B. Co	83.00	85.30
South Carolina	Wm. Cramp & Sons	21.70	24.66
Michigan	New York S. B. Co	24.00	25.70
Delaware	Newport News S. B. Co	00.00	00.65
North Dakota	Fore River S. B. Co	00.00	00.00
ARMORED CRUISERS.			
*South Dakota	Union Iron Works	98.90	99.90
North Carolina	Newport News S. B. Co	88.99	91.50
Montana	Newport News S. B. Co	82.58	84.62
SCOUT CRUISERS.			
Chester	Bath Iron Works	88.72	90.64
Birmingham	Fore River S. B. Co	87.75	89.46
Salem	Fore River S. B. Co	86.57	86.99
SUBMARINE TORPEDO BOATS.			
Submarine T. B. No. 9	Fore River S. B. Co	99.00	99.00
Submarine T. B. No. 10	Fore River S. B. Co	99.00	99.00
Submarine T. B. No. 11	Fore River S. B. Co	99.00	99.00
Submarine T. B. No. 12	Fore River S. B. Co	99.00	99.00
COLLIERS.			
Vestal	Navy Yard, New York	43.00	49.00
Prometheus	Navy Yard, Mare Island	00.70	00.70
TUG BOATS.			
Patapsco	Navy Yard, Portsmouth	21.00	28.00
Patuxent	Navy Yard, Norfolk	18.00	25.00

*South Dakota delivered at the Navy Yard, Mare Island, Oct. 2, 1907.

CYPRUS REFLECTIONS.

Buffalo, Oct. 22.—The talk of marine men is, of course, about the loss of the new Lackawanna steamer Cyprus on Lake Superior, some of it of the casual sort that does not repay repetition and some that is in the line of sharp warning from experts that well deserves heeding.

"When I first read the short report of the loss of the Cyprus," said an old and tried steamboat inspector, "I knew well enough without any details that she was swamped through her hatches, and I want to say right here that if present practices are kept up there will be more of the same sort of losses. It can't be helped, so long as the practice of not trimming the ore cargoes and leaving the hatches unbattened continues. Most of such cargoes will go through safely, but once in a while a steamer will get caught just as the Cyprus was, and then a pretty sure repetition of the Cyprus case follows:

"I am aware that the practice is not to trim the ore cargoes, but I have done my best to stop it. If the insurance people would refuse to insure such cargoes that would correct the abuse, but there are so many companies ready to cover almost anything that it is hard to stop the careless practice. Of course it costs money to trim the ore and where there are anywhere up to 34 hatches in a vessel it is a matter of hours to put the tarpaulins on them. I have left them off myself and so do not speak as a mere critic of other people. I am telling the vessel owners what will happen if they let their vessels go out in this careless way."

There was at first some effort to discover some sort of parallel between the loss of the Cyprus and the Western Reserve, which was one of the first of the modern steel steamers to go down, but the resemblance was found to be entirely from the fact that the two accidents were in the same locality and in each case the second mate only of all the crew was saved. There is much sorrow expressed over the loss of Captain Huyck. He was one of the rather numerous good lake captains who came from the little town of Sheridan in Chautauqua county, N. Y., and is said to have been the only one of them all so far to lose his life in any such way.

But the Western Reserve does not parallel the Cyprus nearly so closely as the steamer W. H. Gilcher, which was also lost that fall, may have done, for the Western Reserve was light, while the Gilcher was loaded, but as there was no survivor in that case all is conjecture. The Bannockburn case is also cited, but she was lost in calm weather.

Some very odd coincidences always occur in connection with such cases. A visitor to one of the marine insurance offices the other day took occasion to ask how the season's earnings looked and was told that it needed one total loss to wipe them all out. At that very moment the storm that ended the Cyprus was brewing on Lake Superior. Still it is reported that the Cyprus was not insured on the lakes, so that London is likely to be called on to pay for her direct. A second call on an underwriter found him figuring up the insurance on the old steamer John W. Moore, which he found to be $94,000 and which he may have to pay, though it is said that the Queen City, the other vessel in the collision, may be taxed for it, or possibly the Moore may be raised.

The loss of the Cyprus has stirred up certain Buffalo vessel owners, so that they will look more closely to their craft, and its management for a while at least. One of them said the other day that his 500-footer, not long in commission, did no sailing with open or unbattened hatches. Even when moving about in Buffalo harbor the captain always had them fastened down securely. It is a good habit to form, even if the crew does grumble over what is mostly unnecessary work. Some day the rule may work out and we have the best of authority for saying that the Cyprus will prove not to be the last to go from the combination of shifted cargoes and unbattened hatches.

So the loss of the Cyprus is not to be carried to the ship yards for correction. "She was built all right," says an authority. There was always much casting about for a structural reason for the loss of the Gilcher and the Western Reserve and it was to a certain extent made to appear that had the latter been loaded she would not have sheared off any rivets and

would have danced about so much less that she would no doubt have weathered the storm. There will of course be no light thrown on the loss of the Gilcher and the Bannockburn.

On the whole the new steel steamer has made a much better history as a sea boat than was feared when the Western Reserve and Gilcher were lost. There is not much uneasiness in ship yards or anywhere else from that direction and if the owner will insist on having his steamer draw a foot or two more water than is safe at all times and the insurance is willing to pay for the new bottoms, the ship yards will very cheerfully do the work at so much per day.

JOHN W. CHAMBERLIN.

LAUNCH OF THE NAVAHOE.

On Thursday, Oct. 10, Messrs. Harland & Wolff successfully launched the ocean-going barge Navahoe, built to the order of the Anglo-American Oil Co. This vessel is 450 ft. long by 58 ft. beam, and about 8,000 tons register, and has been specially designed and constructed for the transport of over 10,000 tons of oil in bulk. The vessel will have an exceptionally complete oil pumping system for loading and discharging, also steam steering gear, deck machinery, etc., all the arrangements being of the latest type. There will also be a single ended boiler (arranged for burning oil fuel) to generate the power for driving the pumps, etc. A very complete installation of electric light is fitted.

The vessel is fitted with six masts, with fore and aft sails and gear complete, also a special towing machine and large patent towing chock for connecting her with one of the company's steamers, by which the barge will be towed across the ocean, the Navahoe being the counterpart of the Iroquois now finishing for the same company, the combination of the two vessels enabling one steamer to bring from port to port 20,000 tons of oil at one time.

The owners were represented by Mr. Maclean, general manager, Mr. Ford, of New York, naval architect, and Mr. Hallenbach, assistant manager of the shipping department, New York.

The battleship Alabama has been berthed at the Brooklyn Navy Yard for repairs. The port engine was disabled at sea through a fracture in one of the cylinders, and it is expected that the repairs will keep the Alabama at the yard for about three weeks.

MARINE INTERESTS ASSOCIATION.

The Marine Interests Association, Marquette building, Chicago, Ill., has been formed for the purpose of endeavoring to establish such relations with the secretary of commerce and labor and the board of supervising inspectors as will bring about the enactment of reasonable rules and regulations governing steamboats and the repeal of any that have become impracticable. The association has mapped out wide work for itself, embracing not only the work undertaken by the National Board of Steam Navigation but also that undertaken by motor boat manufacturers. There is a settled conviction that the rules and regulations governing steam and motor driven craft should have greater flexibility. The association will probably have a delegation at the next annual meeting of the board of supervising inspectors at Washington.

SUBMARINE SIGNALS.

The Submarine Signal Co., Boston, Mass., announces that the United States has arranged for 50 submarine signal stations, Canada nine, England seven, Germany six, Holland five, and Denmark one. These equipments include the Atlantic, Pacific and Gulf coasts of the United States and great lakes, the river St. Lawrence, and the coasts of the United States, the English channel and connecting waters—in short, the regions where fog is the most serious menace to navigation. Fifty-seven steamship lines and five navies have installed on their vessels the apparatus to receive submarine signals.

A REMARKABLE MAN.

The centennial anniversary on Aug. 17 of Fulton's steamboat recalls the genius of this remarkable man in other ways. He planned and built a submarine for use in war and constructed and demonstrated a submarine torpedo in England on October 15, 1805. With 180 lb. of powder and some clockwork which was timed to explode in 18 minutes he blew to fragments the Dorothea, a 200-ton brig which had confidently been lent by Pitt for the experiment. The torpedo had to be towed under water by men in two small boats and drawn under the vessel by ropes, a maneuver contemplated only in the dark during hostilities. It is difficult to place bounds to what Fulton might have done could he have had the benefit of the scientific and mechanical facilities of today.

LAUNCHING A BATTLESHIP.

It costs about $15,000 simply to launch an English battleship, some of the items being: Grandstand for invited guests, $1,000; hire of eight tugs to hold the ship after launching, $1,000; four huge wood and steel cradles, $10,000; tallow, oil and soap to grease the ways, $500; souvenir invitations, $500; present for the lady who launches the vessel, $500, and the banquet which follows uses up the balance. The launching is accomplished by cutting a cord which releases four iron weights, and these, falling quite a distance, knock out the "dog shores" which hold the cradles. The critical instant is when the vessel is almost water-borne with the fore end still on land. The friction from the weight is so great that the false keel is sometimes fused, even under water. Eight chains, weighing about 600 tons, hang from the sides of the ship and drag along the ground to retard the ship.

TIME ON SHIP BOARD.

Time on shipboard is calculated by what appears, at first, to be a complicated method. The twenty-four hours are divided into "watches" of four hours each. One watch begins, for instance, at 12 o'clock. At half past 12 the ship's bell is struck once; at 1 o'clock, twice—two bells it is called—and so on, an additional "bell" being struck every half-hour until 4 o'clock is marked by "eight bells." The watch is then changed, and at half-past 4 "bell" time begins all over again, the bell being struck once again. The period from 4 in the afternoon until 8 is divided into the first and second "dog-watches," each lasting two instead of four hours. The two dog-watches makes seven watches in all, and this enables the crew to keep them alternately, as the watch which comes on duty at noon one day has the afternoon next day, and the men who have only four hours' rest one night have eight hours the next night. This is the reason for having the dog-watches, which are made by dividing the hours from 4 p. m. to 8 p. m. into two watches. "Eight bells" is either 12 o'clock noon or midnight, and 4 o'clock a. m. or p. m. One bell is half-past 12, half-past 4 or half-past 8 o'clock. Two bells may be either 1 a. m. or 1 p. m.; 5 a. m. or 5 p. m. and 9 a. m. or 9 p. m., etc. Here on the lakes the watches are of 6 hours' duration, 6 on and 6 off. Bell time is kept just the same as in the above case, however.

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AMERICAN SHIPPING.

It is understood that an appeal may be made against the recent decision of Attorney General Bonaparte in the matter of transportation of coal to American ports on the Pacific coast in foreign bottoms. Authorities are by no means agreed that his decision is a sound one. On the contrary it establishes a rather dangerous precedent. The American coastwise trade belongs to American ships and it is not easy to understand why any department of the government should set aside a law that no citizen would be permitted to ignore. The transfer of coal to the Pacific afforded the navy department an excellent opportunity to aid the American merchant marine, but the opportunity instead of being seized upon was transformed into a positive injury. The business of shipping has practically slipped from American hands. It is a sad commentary to make upon it, that our foreign tonnage is no greater now than it was a hundred years ago; but it cannot progress under existing conditions and must inevitably cease to exist. All economists to the contrary notwithstanding this is an appalling state of affairs, and one which a country that has a coast line greater than that of any other nation except Russia should not suffer to exist. The economist will say that as long as any one else will transport goods more cheaply than the United States can transport them, that it is good business to permit it to be done; but this is practically begging the question. This nation should be self-contained; it should have its own ships. The United States would have its own ships were it not for its fiscal policy which has protected everything except shipping. The protective tariff has so advanced the general wage scale of the United States that the labor cost of a ship is fully 40 per cent greater in this country than abroad. It has therefore to earn dividends upon a capital cost 40 per cent greater than its rival. Obviously freight rates being equal, it cannot earn them. There is no hope for the revival of the American merchant marine in the foreign trade except through direct governmental aid which will overcome this handicap. The handicap is a purely artificial one and should be met by artificial means.

THE LAKE SURVEY.

"As near perfection as perfection is possible" is the editorial description of the lake survey charts in the MARINE REVIEW of Oct. 10. This commendation is exceedingly pleasing to the officers charged with their preparation and issuance.

The commendation is however qualified, and actually reads "would be as near perfection as perfection is possible," if the latitude and longitude marginal scales were in minute divisions instead of five-minute divisions.

It is believed that the lake survey charts are the best navigators' charts in the world, but that is no reason why they should not be better, and every year does make them better. To find out what masters want, and then give it to them, is the policy of the office.

It is doubtful if a clear conception exists in the minds even of those intimately connected with the commerce of the lakes of the magnitude of the work intrusted to the lake survey.

The great lakes, as the right-of-way of a vast transportation system, in which upwards of $125,000,000 are invested in the vessels, and $50,000,000 a year are paid in freight charges, has to have its civil engineers just the same as the Pennsylvania railroad or the New York Central does. In the organization of this engineering force the lakes are divided into seven engineer districts, having offices at Buffalo, Cleveland, Detroit, Grand Rapids, Chicago, Milwaukee and Duluth. The district engineers are of the corps of engineers under the secretary of war. The magnificent ship locks, harbor constructions, and artificial channels of the lake system are evidences of the wisdom of entrusting the public works of the country to the corps.

The seven district engineers are occupied most largely with the artificial channels and terminals of the lakes—the rivers and harbors.

The lake survey, under Maj. Charles Keller of the corps, corresponds to an eighth district, and is charged with safe-guarding navigation in those portions of the lakes outside the rivers and harbors.

Is there a region of Lake Erie where unknown shoals are still uncharted? The lake survey sweeps it, shows up the dangers, and charts them. Have ice, or storms, or other geological forces shifted old shoals or created new ones? The lake survey examines them. Are the wrecks of years ago menaces to the deeper draught of today? The lake survey relocates, and sounds them.

To do this work a fleet of five steamers has been created, a force of expert engineers has been organized,

and the most modern methods of submarine searches have been put into operation.

All the information gathered by this fleet, and by the seven district engineers, and received from all other reliable sources, is incorporated on the charts, is issued in bulletins, and where it seems urgent to get it quickly into the hands of masters, is mailed in special notices to mariners, and given to the press all over the great lakes.

In addition to soundings, sweepings and magnetic work, the lake survey is making extensive examinations with a view of reservoiring the lakes, or some of them, as Lakes Erie and Michigan and Huron, to prevent low water, and to offset such encroachments on the lake water as are made by the Chicago drainage canal.

All these things are vitally important to navigation on the lakes, and to the safe carriage of deep draught cargoes.

The government, viewing the right-of-way of the lakes as a case of the public ownership of a great transportation system, is bound to protect the carriers to the utmost and cheapen rates, by better lake levels and greater security against unknown submarine obstacles.

This is all very plain to those who know the lakes as masters or ship owners, but the last congress cut the appropriation necessary to carry on the engineering operations of the lake survey, so that only three out of the five steamers of the survey are now in commission, the engineering force is reduced by more than half, and the engravers are working on half time.

The lake survey with little money in its pocket is doing its best to give the navigation interests of the lakes what they want, and has faith that if the work it does on the lakes is needed, the reasonableness of financing it will be made apparent to congress.

Meanwhile with 117 different charts to keep up to date, the patience of those interested in the matter of latitude and longitude scales is invoked.

Keeping the charts up to date is in itself a large undertaking, and because so many things are constantly coming up discoveries of new shoals and wrecks, the opening of the West Neebish, frequent changes in lights, new channels in the Detroit river—a last year's chart is like a last year's newspaper and should be torn up by progressive masters, and replaced by a fresh revised chart.

NEW EXCURSION STEAMER.

The new excursion steamer for which contract was given to the American Ship Building Co. two weeks ago by the Lake Erie Excursion Co., will be built at the Buffalo ship yard and will be ready to go into commission at the opening of the excursion season next spring. When the contract was let the name of the proposed owners of the vessel was given as the Crystal Beach Navigation Co., but this company has since been reorganized under the name of the Lake Erie Excursion Co., and is composed of well-known Buffalo and Cleveland vessel men. The new steamer will run between Buffalo and Crystal Beach.

In appearance the steamer will resemble the Columbia plying in the Detroit river excursion trade. She will be built entirely of steel and will cost about $225,000. Her dimensions are to be 215 ft. over all, 45 ft. beam and 46 ft. beam over guards. Her bulkheads, water-tight compartments and water bottom will aid to make her almost, if not entirely non-sinkable. The machinery equipment will be of the most modern and up-to-date type, consisting of triple-expansion engines, with single screw, two boilers 12 ft. diameter by 12 ft. 6 in. long, fitted with Ellis & Eaves draft.

She will have accommodations for 3,500 passengers. Every known comfort has been provided for passengers. There will be a library-retiring room for ladies and smoking-room for gentlemen, both of the most substantial and luxurious character. A particularly attractive feature will be a grandstand which is to be erected on the mezzanine deck in such a way as to permit all passengers to hear the music which will be rendered regularly by an orchestra. The electric illumination on the steamer will be a great attraction. She will have four spacious decks which will provide dancing room for the passengers while enroute. Her seating plan will be given special care and attention. Broad gangways, stairways and spacious cabins will be another improvement over the prevailing type of excursion boats. It is estimated that 3,500 passengers can be discharged from this boat to the dock in ten minutes.

MOORE ABANDONED TO THE UNDERWRITERS.

The steel steamer John W. Moore which was in collision with the steamer Queen City in the Detroit river on Oct. 6, and sunk, has been abandoned to the underwriters, Worthington & Sill of Buffalo. The steamer is probably a total loss. The Moore was owned by F. M. Osborne of Cleveland and was built by the Craig Ship Building Co. at Toledo in 1890. The Moore was 246 ft. keel, and 40 ft. beam. She lies in thirty-three feet of water, and it is reported by divers that her keel from the stem is pushed back under the pilot house. The Queen City was also damaged considerably, and she will be out of commission about two weeks. Her whole port bow will have to be taken off, her two hawser pipes are broken and the bulwarks in the forecastle deck is laid flat. She is being repaired at Cleveland.

FREIGHT SITUATION.

The distinguishing characteristic in the freight situation at present is the shortage of coal at Lake Erie ports, due to lack of cars. The shortage has been so acute that vessels have been unable to obtain fuel and have been compelled to fuel in the rivers. The movement of coal, however, throughout the season has been quite heavy and the present shortage is not expected to affect the supply in the northwest, which is believed to be ample.

The grain trade is also feeling the effect of the car shortage and the work of unloading at Buffalo is slow. The grain tonnage, however, is in good demand at 2½ cents on wheat from Duluth, but owners are rather slow to charter as long as dispatch is so slow and believing also that the rate will presently advance.

IRON SITUATION.

Though there are increasing indications that iron and steel manufacturers are preparing for less active conditions of business, there is nothing in the general situation to justify the disordered state of affairs which has ruled in some of the large business centers within the past week. New business in iron and steel lines, with the possible exception of wire products, is light. The prices of light rails have been reduced from $2 to $3 a ton, according to sections, on account of shortage of orders and sharp competition. A weakness has developed in southern iron, No. 2 foundry, which had been held at $18 for this year's delivery, having been sold as low as $17.25. A fair tonnage of structural business is being done.

GREAT LAKES REGISTER, NEW TABLES

When for the first time the marine architect or builders of ocean-going vessels, steps foot on board the completed modern lake-built bulk freight steamer, that now dominates the freight traffic of the great lakes, they will marvel at the genius and inspiration of the lake ship builder.

The proportions of these vessels exceed the limit of all previous rules laid down for ship building, unless it be for rivers and canal craft.

The rules given in *Lloyd's Register of Shipping* and also in *Bureau Veritas International Register of Shipping* for the proper proportions of an ocean-going vessel of one or two decks, are that the length between the stem and sternpost should not exceed eleven times the vessel's depth measured from the top of keel to the to the top of the spar or weather deck beams, and that the length thus given should not exceed seven times the greatest beam of the vessel—and when it is found desirable to deviate from those proportions, compensation in way of additional strength to the various members of the vessel are given in tables prepared for that purpose, and when the proportions exceed 16 depths to the length, plans of the proposed vessel must be submitted to the proper members of the societies for consideration.

We would call the attention of the reader to these well-known rules, that the true conception of the extreme proportions of our modern lake built bulk freighter may be arrived at.

In our vessels of 600 feet in length and 32 feet depth of hold, we have a proportion of nearly 19 depths to her length, and by interpolation a vessel of 700 feet in length would give the unprecedented proportions of 20 depths to the vessel's length.

In comparing the proportions of the ocean and lake vessels the impression is that so much difference should not exist, that the extreme in the lake built vessels is beyond the limit. We should consider that while the ocean-going vessel has to contend with the winter storms of the north and south Atlantic, and with seas estimated to reach a height of 33 to 35 feet from the ocean level, the worst storms on Lake Superior fail to build a sea that will exceed seven feet in height from the lake level. This being the case we find the proportions for safety and fitness to be in favor of the lake-built vessels.

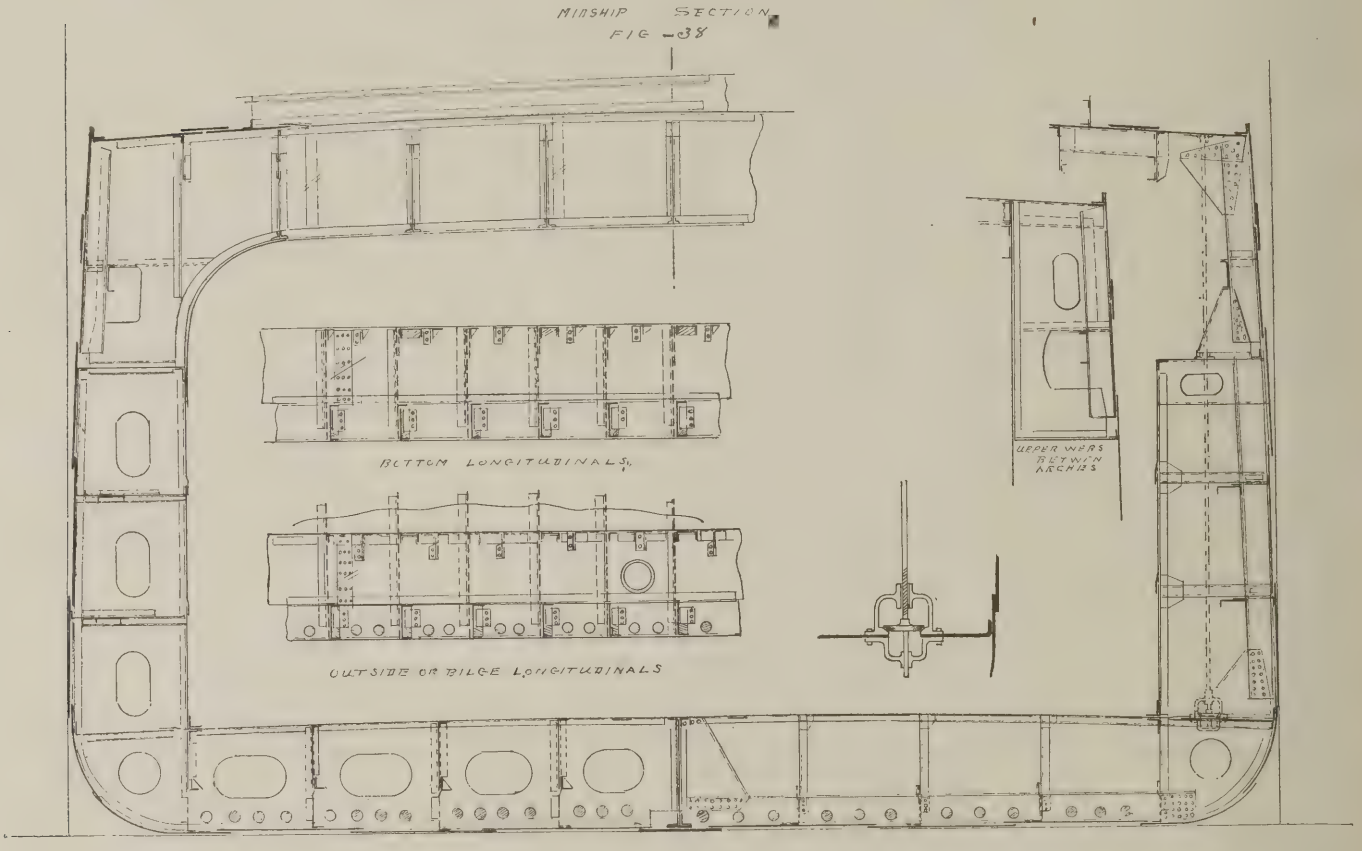
And in addition to the above mentioned extreme proportions, the modern lake-built bulk freighter include marked and novel changes from the type of the lake-built freighter of ten years ago.

By a system of deep plate and angle, spar deck arch girders all beams and stanchions within the cargo space are dispensed with, and all laid decks above the double bottom within the cargo space are also dispensed with.

These radical changes together with the introduction of side trimming tanks fitted between the double bottom and the main deck stringer on either side, and extending the full length of the cargo hatch, are inventions of the lake ship builders and architects, deserving of all praise.

For not only do they meet the demand for the rapid handling of bulk cargoes made imperative by the ever increasing volume of freight product flowing to the various lake centers, but it has been demonstrated beyond a doubt that this new type of vessel can be so built as to demand the fullest confidence in their ability to combat with ease and safety the seas and storms of the great lakes.

The dissimilarity in the construction of this novel type when compared with the steel freighter of five years ago is not generally understood by



SPACEING OF HATCHWAYS AND GIRDERS

FIG 39

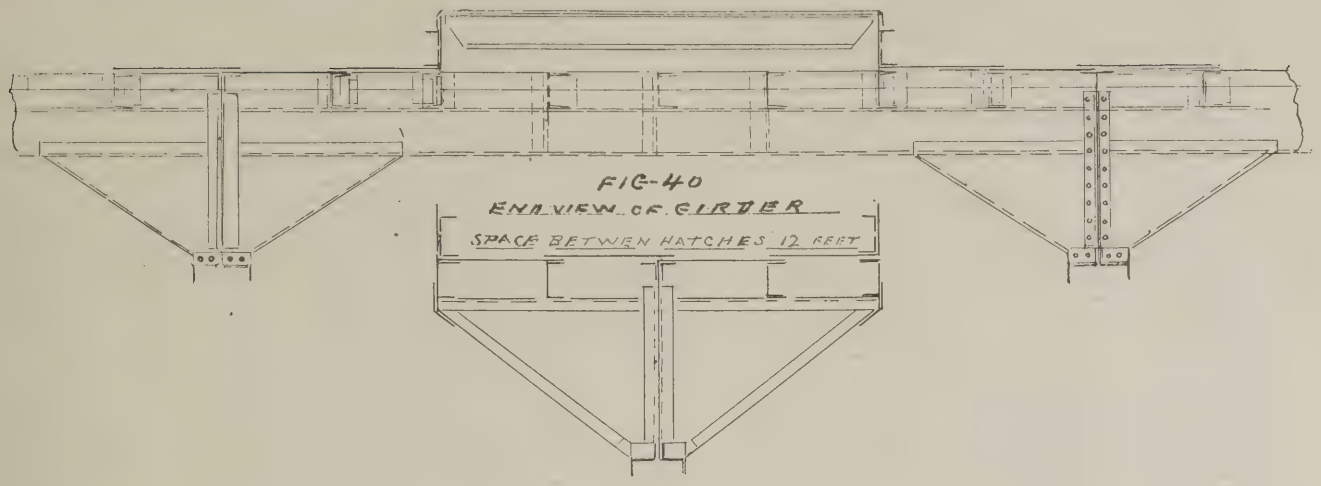


FIG-40
END VIEW OF GIRDER
SPACE BETWEEN HATCHES 12 FEET

PLATE STRINGER AT OUT BOARD END OF HATCHES

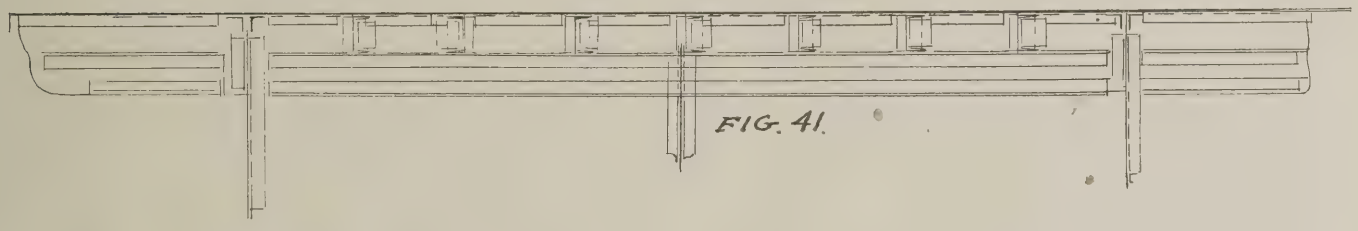


FIG. 41.

our lake people, and of course a mystery to the outside world.

This being true the management of *Great Lakes Register* believing it to be their province and duty, have with care and painstaking, endeavored to describe the method of construction in the new rules and tables which they have completed, and are now ready for publication.

And in submitting the work, we invite the friendly criticism of the lake ship builders, and ship owners, and especially do we invite the criticism of the lake ship builder with whom our committee and surveyors are in daily communication. We shall be glad to discuss and remedy such points as may prove to be in error.

In view of the fact that this particular type of vessel is unknown in any other part of the world, tables of a like construction, it is fair to suppose, do not exist. Therefore, our best and only field of research for the desired material were the lake ship yards and the office of *Great Lakes Register,* where detail drawings, specifications and reports of the general condition of these vessels, since these have been in commission, are to be found.

With the data thus obtained and a score or more of vessels of the type in question, that have been in commission from one to four seasons, as our blazing marks, we have gathered

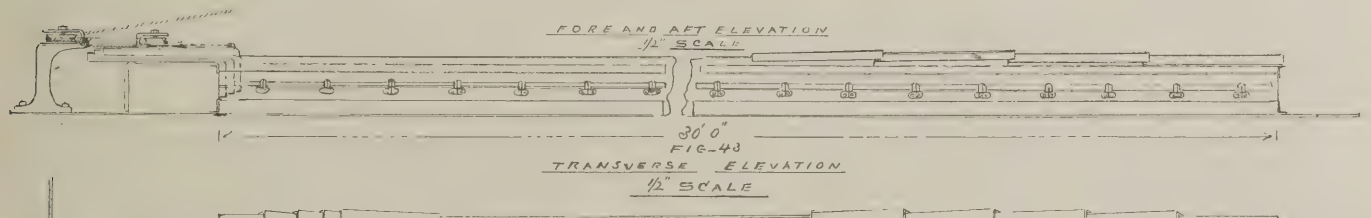


FIG-43
TRANSVERSE ELEVATION
1/2" SCALE

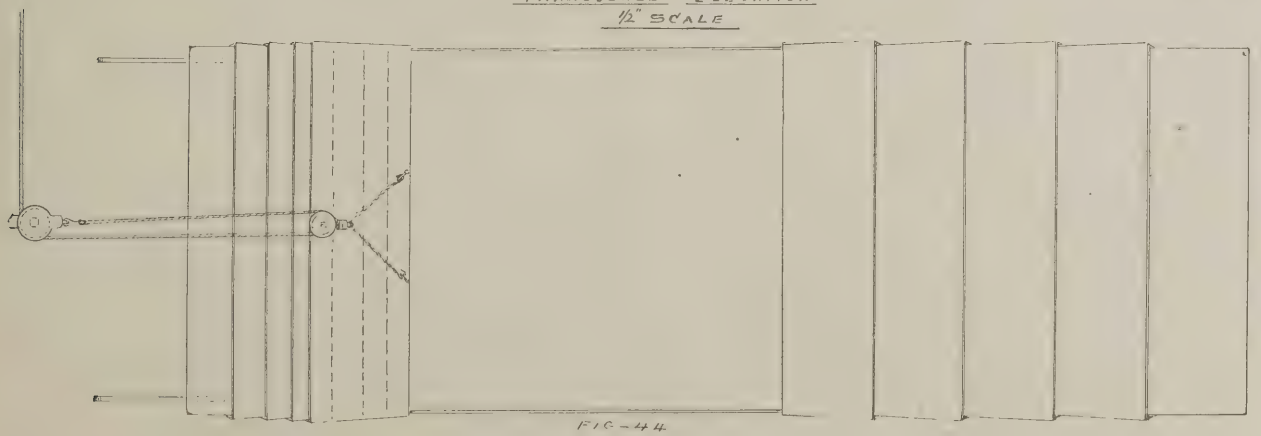
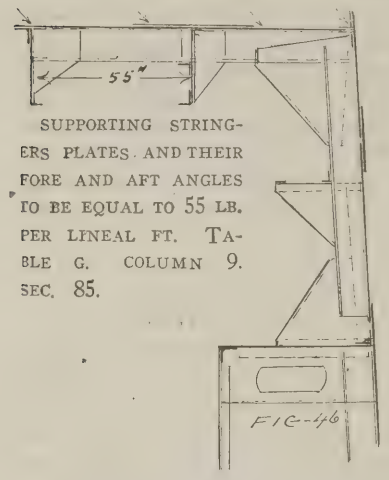


FIG-44
PLAN
OF SPAR DECK HATCHWAY
3/8" SCALE

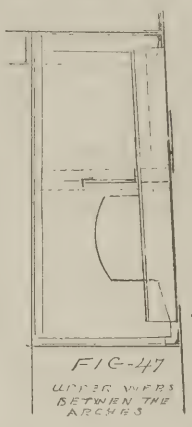
material for our new table.

And in choosing the material we have dissected and applied the scantlings of such vessels among the chosen list, that have withstood the demanded that their condition should be looked into.

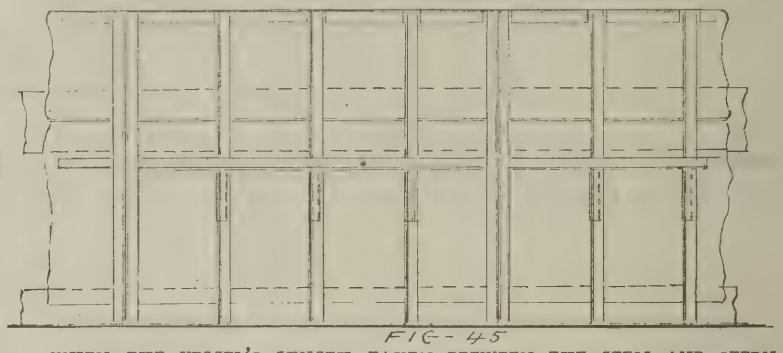
The most earnest pleadings came from the spar deck stringers, who reluctantly acknowledged that they were



SUPPORTING STRINGERS PLATES AND THEIR FORE AND AFT ANGLES TO BE EQUAL TO 55 LB. PER LINEAL FT. TABLE G. COLUMN 9. SEC. 85.



WHEN BY TABLES G., COLUMN 8, THE SEAM STRAP OR DOUBLING PLATE CONNECTING THE TWO SPARDECK STRINGER PLATES IS 48 IN. WIDE OR MORE, THE SPARDECK STRINGER ANGLE BAR SHOULD BE RE-ENFORCED BY ANGLE BARS OF THE SAME SECTION, BUT SOMEWHAT LESS IN WEIGHT THAN THE TABULAR STRINGER ANGLE BAR, FITTED INTERCOSTAL BETWEEN THE BODY FRAMES FOR TWO-THIRDS THE VESSEL'S LENGTH AMIDSHIPS, THE RIVET HOLES IN THE STRINGER FLANGE TO BE FAYED WITH THOSE OF THE UPPER GUNWHALE BAR AND RIVETED TOGETHER AND TO THE SHEER STRAKE. SEE FIG. 47.

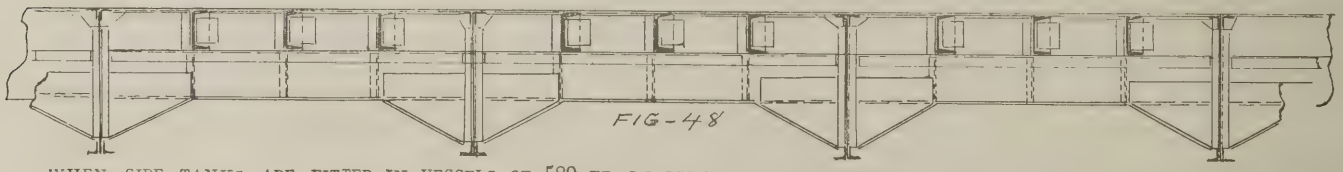


WHEN THE VESSEL'S LENGTH TAKEN BETWEEN THE STEM AND STERN POST IS 580 FT. AND ABOVE, AND SIDE TANKS ARE NOT FITTED, THE CHANNEL BAR FOR TOP SIDE AND HOLD STRINGERS SHOULD BE DISPENSED WITH AND PLATE AND ANGLE STRINGERS AS SHOWN IN FIG. 48 FITTED IN THEIR STEAD.

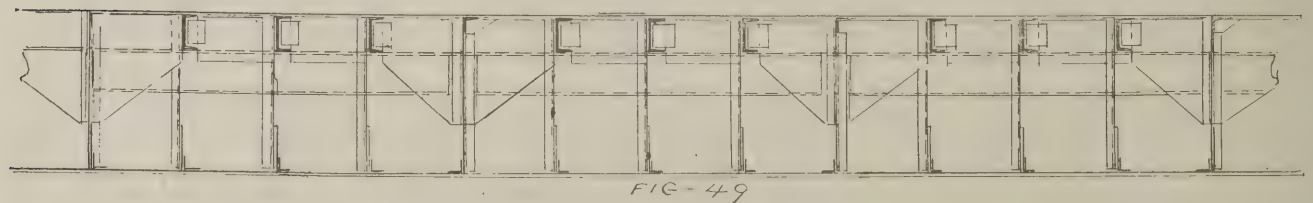
no longer able to do their share of the work without serious risk to the other members of the family. They demanded re-enforcement in the way of heavier and wider seam straps or doubling plates, and that all butts of their various members be secured by double straps the full width of the stringer, including the butts of the seam strap, and that the butt straps be made heavier and fitted with rivets of greater diameter than in the original. They enter a strong protest of the theory that the side tanks in the cargo hold are of any assistance

These tables, together with their writeup from Sections 67 to 92, will be printed on salmon tinted paper that they may be readily referred to, and known as the *Pink Table.*

In order that our *Book of Rules and Regulations* may be in the foremost rank of up-to-date work, we have not only completed rules and tables for the building of the bulk freighter, above mentioned, but have revised our rules and tables of 12 years ago for steel vessels of the package freight type.



WHEN SIDE TANKS ARE FITTED IN VESSELS OF 580 FT. IN LENGTH, THE STRINGERS WITHIN THE SIDE TANKS MAY BE OF CHANNEL BAR FORM SECURED TO WEBS BY STRONG BRACKET AS SHOWN IN FIG. 49.



necessary tests, both in ballast trim and deep loaded, and not found wanting. Our surveyors who attended on these vessels during their building have repeatedly examined them since they have been in commission and their reports filed at the society's office, show that the majority of them are doing the work without complaint.

Some few there are that have shown signs of distress, and like "Kipling's Ship," the disgruntled members

to them situated as the side tanks are near the neutral axes of the structure far below the spar deck stringer, all of which the committee have considered in compiling the tables.

As these larger vessels are handled by the lake captain, with apparently less mishaps than with their late command of half the size. It is possible that much larger vessels of the kind will be built. With this in view, the committee has by careful interpo-

DULUTH GRAIN TRADE.

Duluth, Oct. 23.—Grain receipts and shipments at Duluth for the week ending Oct. 19, 1907, were as follows:

	Receipts.	Shipments.
Wheat	2,682,644	2,265,127
Corn	4,986	.....
Oats	136,369	101,873
Rye	48,214	27,997
Barley	791,674	1,420,087
Flax	864,786	699,788

Sandusky Bay outside gas buoy No. 2, reported extinguished, has been relighted.

QUESTIONS FOR MASTERS AND MATES.—NO. 46.

625. Engine disabled how would you keep your boat out of the trough of the seas with the equipment on board an ordinary lake freighter?

626. What is the easiest position a steamer will weather a gale?

627. What does knot indicate, speed or distance?

628. Is it necessary to say so many knots per hour?

629. Is it necessary to say so many miles per hour?

630. In your opinion do you think that by the use of oil in heavy gales it would assist in preventing many of the accidents that occur on the lakes?

631. How much faster is the mean sun time at Cleveland than at Chicago?

632. In lake vessels what is the increase or decrease of the magnetism of steel hulls mostly due to?

633. Is it important to reverse a new steel hull after launching and leave it so while the finishing is being done?

634. Why?

QUESTIONS FOR WHEELSMEN AND WATCHMEN.

TWENTIETH INSTALLMENT.

225. What is a timber-hitch and how is it made?

226. What is a clove-hitch and how is it made?

227. What is a timber-hitch and a half-hitch?

228. What is a carrick bend and how is it made?

229. What do you understand by Rule 22?

230. Draw a diagram showing a sailing vessel on the starboard tack and the direction of the wind.

231. Draw a diagram of a vessel running free.

232. What do you understand by Rule 27?

233. How do you understand Rule 9?

234. If you were steering E x S with the wind and sea running from the NNW, how would the sea strike the ship?

235. How would you take care of a lead line to keep it in the best of condition?

ANSWERS TO QUESTIONS FOR WHEELSMEN AND WATCHMEN.

EIGHTEENTH INSTALLMENT. PUBLISHED OCT. 10.

201. On the starboard side.

202. Going in from seaward red buoys mark the right hand side of the channel and black buoys the left hand side.

203. Indicates a channel on either side of it.

204. On the starboard side.

205. A steady light; one that shows continuously.

206. Sand (sand bottom).

207. Life-boat.

208. A can buoy has a round top like a ball and sometimes a flat top while a nun buoy is more on the cone shape, both on its top and bottom; a can buoy is cone shaped on the bottom.

209. On the port side.

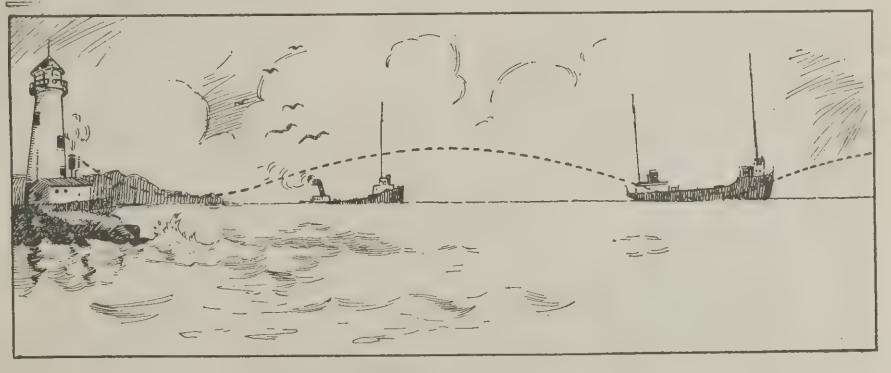
210. That it should be left to starboard.

211. 6 feet.

212. 120 feet.

SOUND "SHADOWS" IN FOG.

The following illustration depicting the probable deflection of sound waves and how "shadows" or inaudible zones occur will prove of interest, since the subject has been discussed at some length through the columns of the MARINE REVIEW. Colonel Anderson's contribution to the discussion has been received with a great deal of interest. Colonel Anderson is chief of the engineer's office, Department of Marine and Fisheries, Ottawa, Canada, and having built so many Canadian lighthouses, his experiences and experiments have brought him in close touch with this subject, all of which contribute to the value of his thoughts and statements. It may not be out of place to also state that Colonel Anderson is a Fellow of the Royal Geographical Society.



SHOWING SOUND SHADOWS, OR SOUND WAVES RICOCHET.

As is already known repeated experiments have proven that sound in fog is erratic, and that mariners run a grave peril when they trust to fog signals alone. The reason for this ungentlemanly behavior of sound is designated as "sound shadows," within which the ear detects no trace of the signal, although the fog signal may be blowing continuously, and the sound therefore is perfectly audible on all sides of the shadow. In many cases the cause of a sound shadow can easily be discovered. The existence of a bluff behind the whistle sometimes makes the sound waves ricochet in a bounding manner over the water, perfectly audible at say one mile, inaudible at two miles, and distinctly heard again at three miles. It is impossible to trace the origin of many sound shadows because they are doubtless due to some peculiar condition of the atmosphere.

A STRONG ENDORSEMENT.

The following letter will explain itself without further introduction:

Mr. Clarence E. Long, MARINE REVIEW:

Dear Sir—I am in receipt of your Course Finder, Deviation Log and Deviation Diagram and its book of explanations. I can assure you that they are very useful and necessary articles; and I do not believe that any pilot should be without them. The Course Finder should be the property of everyone studying for papers. I had contemplated a book similar to your Course Finder, and I am pleased to congratulate you on its efficiency. I have used Baxter's Diagram for some time, but I think your Course Finder and Deviation Diagram much simpler. In compiling such a work slight mistakes are liable to occur, which may be observed by proving the course. I regard them as important aboard ship as the sun compass itself.

Very truly yours,

E. O. WHITNEY,
Master Str. Samuel F. B. Morse.

Capt. R. Rieboldt has resigned as master of the Brazil, and Capt. William Mackin, who had charge of the Bulgaria, has been appointed in his place. Capt. D. A. Kendall has taken charge of the Bulgaria.

BUILDERS' TRIAL OF COLLIER EVERETT

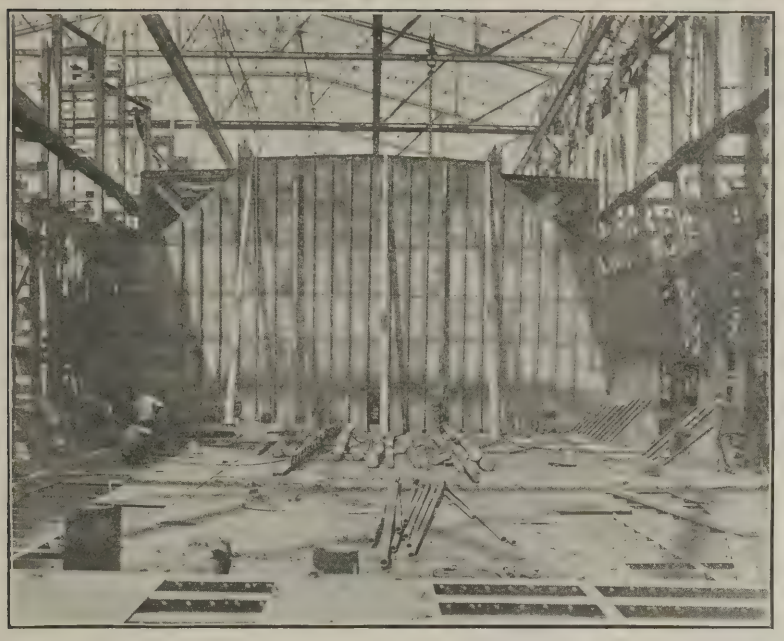
Quincy, Mass., Oct. 16.—The big new steel steam collier Everett, built by the Fore River Ship Building Co., had her builders' trial today and realized the expectations of her designers and constructors by developing a speed of 12.12 knots and demonstrating in every way her capabilities for the business in which she will be engaged. The ship was built for good hard service, rather than for speed, but the fact that she did a knot and a fraction better than her contract called for was very gratifying to her builders.

Yesterday evening the final dock trial of the ship's engines was had and then all hands turned in to be up bright and early this morning, for the ship was to go down Fore river on the early tide. It was half past six when Port Capt. Evans of the Fore River Ship Building Co., who was in command of the vessel, backed her away from the dock. Safely negotiating the narrow channel and the draw-bridge in Fore river, the Everett headed out into Boston harbor and the first vessel to salute her was the turbine steamer Yale hurrying into Boston on her trip from New York. The Everett was abeam of Boston lightship at exactly 7:54 o'clock and the test was on. Her contract called for an average speed of 11 knots an hour, for four hours, the ship to be loaded with 300 tons of bunker coal, 25 tons of fresh water and stores, and all water ballast tanks filled. Under these conditions the test began, the total weight of the water ballast being 3,030 tons. She drew 12 ft. 1½ in. forward and 18 ft. 9½ in. aft. The morning was cool with a fresh breeze from the northwest. Capt. Evans lay his course northeast and the ship moved steadily through the water toward the whistling buoy off Thatcher's Island, a distance of 20⅜ miles.

When she reached Thatcher's Island buoy, the chronometers were watched, the time taken, and it was seen that the vessel had developed a speed of 12.12 knots, a most gratifying showing. The ship kept on her course until off the Salvages, when Capt. Evans turned and made a letter S, showing the great ease with which the vessel can be steered. The return over the course was begun at the Thatcher's Island buoy at 10:06 o'clock and was finished at Boston lightship at 11:49 o'clock, and on this run she developed a speed of 11.8 knots.

Her average main steam pressure for

THE COLLIER EVERETT ON HER BUILDERS' TRIAL, OCT. 16, 1907, WITH ALL WATER BALLAST TANKS FILLED TO A TOTAL WEIGHT OF 3,000 TONS; 300 TONS OF BUNKER COAL AND 25 TONS OF FRESH WATER AND STORES, SHOWING THE IMMERSION OF THE VESSEL WHEN RUNNING LIGHT.



ONE OF THE WATERTIGHT BULKHEADS, SHOWING THE SHAPE OF THE HOLD AND THE TRIANGULAR SHAPED WATER BALLAST TANKS AT THE TOP AND SIDES.

the four-hour run was 160 lbs., and the average revolutions per minute of the main engine for the four-hour run was 70.7.

After completing this run the ship slowed down off Boston light and her two anchors were lowered and hoisted. On the starboard anchor 30 fathoms of chain, cable were taken in by the big winch in 7 minutes and 5 seconds.

The top side ballast tanks, 10 in number, were also emptied and the time consumed was exactly 40 minutes. There are five of these tanks on each side of the vessel and they carry water as follows:

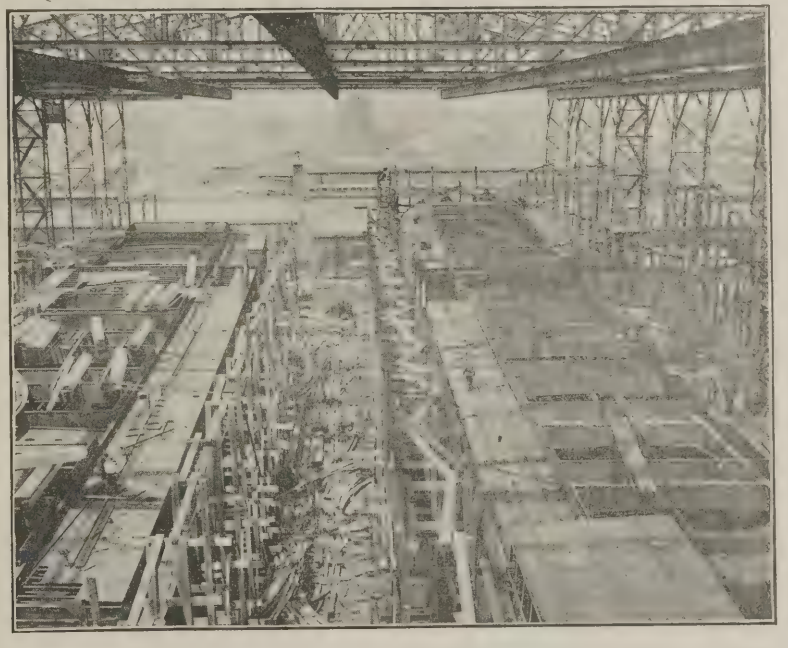
Tank No.	Tons of water.
1	120
2	106
3	98
4	98
5	99

The fore peak tank holds 465 tons and the after peak tank 134 tons. The tanks in the double bottom contain water as follows:

Tank No.	Tons of water.
1	199
2	266
3	247
4	247
5	239
6 (fresh water)	126
7	61

Total weight of all water ballast, 3,030 tons.

CAPT. P. FROSTEAD
Who will command the Everett.



THE EVERETT ON THE STOCKS, SHOWING THE TEN LARGE HATCHES OPENING INTO THE FIVE BIG HOLDS, WITH A TOTAL CAPACITY OF 7,200 TONS OF COAL.

The Everett reached the yard of the Fore River Co., at 2:35 p. m., her siren whistle screeching the message to the men in the yard that the ship had done all that was expected of her. President F. T. Bowles, of the Fore Riven Ship Building Co., said: "It was a very satisfactory trial. The ship has given every evidence of an ample margin of speed over and above the contract." Charles Skentelbery, marine superintendent of the Massachusetts Steamship Co., for which the vessel was built, said: "We had a good trial trip. Everything so far as we can see is very satisfactory. She certainly is a fine ship."

The engine room force on this trial was made up entirely of Fore River men under the supervision of Chief Engineer Edwards and Engineer Paige. On board the vessel were: President Bowles, Electrician Engineer Crain, of the Fore River Ship Building Co.; Marine Superintendent Skentelbery, of the Massachusetts Steamship Co., and Messrs. Linden Stuart and John R. Middleton of his staff; Miles Erb, chief engineer of the powerhouse, and James Lyman, chief engineer of coal operating machinery of the N. E. Gas & Coke Co.; Capt. W. E. Hadlock, the compass adjuster; Capt. W. M. Smith and Capt. A. Abbott, who will command the Malden and Melrose, sister ships of the Everett soon to be launched, and the following officers who will be on the Everett when she goes into service: Captain, P. Frostead; first officer, A. McGray; second officer, E. H. Holland; third officer, A. H. Anthony;

chief engineer, A. Mearns; first assistant, W. K. Queen; chief steward, Philip Harris.

The Everett was built for the Massachusetts Steamship Co., and will be used for carrying coal between Boston and southern ports. She is an important addition to the American merchant marine, as her equal in ships of her class does not exist under the American flag. There are two other ships of the same size and type building at Fore River for the same company. One, the Malden, was launched on Sept. 10, the other, the Melrose, is nearly ready for launching. These three colliers will work a great change in the tide water coal carrying trade of the North Atlantic seaboard. The reasons for this were shown in his remarks made at the launching of the Everett by President James L. Richards, of the New England Gas & Coke Co., for which company these vesesls will be in service. After a reference to the unsatisfactory method of transporting coal by sailing ships and in barges towed by tugs and the delay at the loading and unloading points, the consequent demurrage and other costs Mr. Richards said:

"We finally concluded that, taking everything into consideration, the most economical method of transportation would be by a steel steam collier carrying about 7,000 tons in addition to coal for its own requirements."

The contract for three colliers of this type was made by the Fore River Ship Building Co., on Oct. 26, 1906. The keel of the Everett was laid on Jan. 22, 1907. She was launched July 11, 1907. She is particularly suited for deadweight cargoes which can be loaded by means of chutes and discharged by mechanical grabs. There are ten exceptionally large hatchways each 28 ft. wide and 14 ft. long, with two hatches to each of the five cargo holds, which latter are each 48 ft. long. She is 400 ft. long with an extreme breadth of 53 ft., a depth of 32 ft. and a gross tonnage of 5,107 tons.

The special feature in her construction is known as the self-trimming system.

She is of the single deck type, with single screw and triple expansion surface condensing engine and four single-ended Scotch boilers constructed for a working pressure of 180 lbs. All the machinery is located aft. She has a crew of thirty-five men all told. Exceptionally powerful pumps enable the vessel to discharge all water ballast tanks in six hours.

An inspection of the ship will open the eyes of seafaring men for there was never such equipment and appointments in a collier. The quarters of the deck officers and engineers are finer than in many passenger ships. The pilot house and bridge are particularly handsome structures, being finished in natural teak. There are bath rooms, toilet rooms, electric lights, telephones and all such conveniences. On the flying bridge is a powerful electric searchlight. One of the ship's boats is equipped with a gasoline engine which can be used in going ashore and for many other purposes. The quarters of officers and men are heated by steam. The vessel is very handsomely painted; her railings in aluminum, her name in gold leaf. She has towing bitts and towing rail aft. She has two metal life boats, a gig and a dinghy. The Everett is completely fitted out with flags, stores, bedding, linen, dishes and ware and ready for immediate service.

FOUR LAKE LAUNCHINGS

The steel steamer Josiah G. Munro, building for the Frontier Steamship Co., North Tonawanda, N. Y., of

MISS MARION H. SEAVEY, SPONSOR, LEAVING THE LAUNCHING STAND.

which W. M. Mills is manager, was launched at the Ecorse yard of the Great Lakes Engineering Works on Saturday morning last. There have been many quick and successful launches at lake yards, but this was the speediest of them all, taking place the instant that the launching party reached the stand and with a suddenness that caught every photographer on the grounds unawares. Miss Marion H. Seavey, of Boston, granddaughter of the man in whose honor the steamer was named, was not, however, caught napping, smashing the bottle vigorously across the steamer's bow. So quickly, however, was the whole thing done that it is safe to say that the steamer was in the water before half the launching party had time to turn their heads around to look at it Immediately after the launching the ship building company tendered a luncheon to the guests at the Detroit Club, Harvey H. Brown, of Buffalo, acting as toastmaster.

The speech of Josiah G. Munro was easy, natural and affecting. He considered the naming of the ship after him the greatest honor of his business life and he only wished that he had words fitting to express his appreciation to the younger element which had conferred this honor upon him. He added that he would always think of the steamer as a shuttle in the loom of the great lakes, weaving the fabric of internal commerce. He expressed his regret that there were not similar

MR. JOSIAH G. MUNRO ON THE LAUNCHING STAND.

looms for our over-sea trade, saying that our position as carriers in the foreign trade, which was supreme fifty years ago, has now practically

TWO VIEWS OF THE MUNRO LAUNCHING PARTY.

vanished. He felt this to be a condition that cried aloud for remedy.

Antonio C. Pessano, president of the Great Lakes Engineering Works, in responding to a toast said he could not foresee the time when lake ship builders would not have a ship to build. The natural increase of commerce is 5,000,000 tons per annum. A ship, such as the Josiah G. Munro, will carry 200,000 tons of this in a season, but it will require thirty-five ships like her to carry the 5,000,000 tons and, in point of fact, when the natural wastage of older vessels is considered it will require forty-one ships like her, which is about all that the lake ship builders can comfortably build in a year. He thought these figures, while taking care only of the natural increase from year to year, gave a good idea of the great transportation business of the central west, a circumstance which eastern people do not appreciate and which he himself did not realize until five years ago when he came west himself.

The speech of W. A. Rogers was especially felicitous. He thought the Josiah G. Munro would be one of the best advertised ships on the lakes. He doubtless had in mind the advertising that the W. A. Rogers received when she started on her career as a record cargo breaker a year or more ago. He related that the Josiah G. Munro would shortly be emblazoned as having carried the largest cargo of coal that ever left Sandusky; that never before was such a cargo delivered in the harbor of Cheboygan; no such cargo of ore ever left Escanaba for South Chicago; nor from Fort William or Port Arthur were ever such cargoes of grain carried before. He added that if the ship partook of any of the qualities of the man after whom it is named it will be a very good ship. Josiah G. Munro as a business manager has always taken good care of his friends. Mr. Rogers therefore predicted that the steamer would declare good dividends. He thought also that in fuel consumption she would be very low, illustrating it by saying that he had persistently for many months invited Mr. Munro to luncheon in order to discover how many excuses a man could invent for declining, and as far as he could personally testify Mr. Munro never ate. The Josiah G. Munro therefore would operate upon an exceedingly moderate consumption of fuel.

Mr. Rogers had in his talk used certain biblical quotations which caused Mr. Livingstone, president of the Lake Carriers' Association, to remark that iron men must be somewhat different from steamboat men as steamboat men generally resorted to the scriptures only in times of trouble. As Mr. Livingstone's toast was upon the commerce of the lakes he said that he had no fears of its future prosperity and that it was growing so rapidly that even half a dozen years back if any one predicted a steamer of the size of the Josiah G. Munro he would be regarded as a lunatic.

W. M. Mills upon being called upon stated that for eighteen years Mr. Rogers had been teaching him to keep his tongue still. After a few remarks by Hugh Kennedy a toast to the sponsor closed the speaking.

Those present at the launching were: Miss Marion H. Seavey, Mrs. Wm. M. Seavey, Mrs. Wm. H. Seavey, Miss M. H. Munro, Mrs. M. R. Richards from Boston; Josiah G. Munro, Mrs. Munro, Capt. and Mrs. J. J. H. Brown, Harvey L. Brown and Mrs. Brown; Wm. A. Rogers, Hugh Kennedy, Miss Rachel Kennedy, W. J. Fredericks, E. W. Stith, from Buffalo; L. S. DeGraef and Mrs. DeGraef; Mr. and Mrs. W. M. Mills, Mr. and Mrs. McKenzie, Master McKenzie, Mr. and Mrs. John A. Stitt, J. J. Patterson, George Vandervoort, from North Tonawanda; B. J. Stedman from Batavia, N. Y.; E. P. Lenihan, James Nacey, from Cleveland; Mrs. H. N. Sturms, from Ann Arbor; Mrs. W. T. Bradford, Miss Bradford, Wm. Livingstone, Mr. and Mrs. Clark, Antonio C. Pessano and John R. Russel, from Detroit.

The steamer Josiah G. Munro is practically a duplicate of the J. H. Sheadle, differing in a few minor details. She is 550 ft. over all, 530 ft. keel, 56 ft. beam and 31 ft. deep, having thirty-two hatches spaced 12 ft. centers. Her engines are triple-expansion with cylinders 23, 37 and 63 in. diameters by 42-in. stroke, supplied with steam from two Scotch boilers,

(Continued on page 32.)

THE THEORY AND PRACTICE OF LAKE NAVIGATION

BY CLARENCE E. LONG

POSITION FINDING CONTINUED.

ANSWERS TO BEARING PROBLEMS.

1. 31-3 miles ESE ¾ E.—4-point bearing.

2. 3.87 miles—a 4-point bearing.

3. 2.38 miles—a 2½-bearing.

4. 3¾ miles nearly—a 5-bearing.

5. 6 miles SSE of the light on the 2-point bearing; 4.2 miles when abeam. The two together are the combination of the 2-point and 4-point bearings.

6. 2.87 miles SW by W ½ W—a 3-point bearing.

7. 3.2 nautical miles.

8. 10⅛ miles from Pilot Island; 9¾ miles from Cana Island.

9. 5 min. 16 sec.

10. 4 min. 54 sec.; 4 min. 39 sec.; 6 min. 40 sec.; 6 min. 14 sec.; 5 min. 23 sec.; 5 min. 51 sec.; 4 min 31 sec.; 6 min. 51 sec.

11. 13.27 miles.

12. 11.1 miles.

13. 3½ miles from the lighthouse; correct magnetic course SW by S; compass course SW ¼ S; a scalene triangle bearing.

14. 5¼ miles from North Manitou; 7 miles from South Manitou.

15. 8¾ miles from Cana Island; 7⅞ miles from Pilot Island; NNE ¾ E—24¼ miles.

16. 8½ miles from Manitowoc; 7¾ miles from Twin River Pt.; E by N to Manistee.

17. (a) 14½ miles, nearly, per hour. (b) 21¾ knots; (c) probably the blades of the rotator have too much pitch, or the rotator slips—turn blades in slightly; (e) W by S; (f) one point forward of the starboard beam.

18. 19 hrs. 22 min.; 176.6 knots.

19. 6 hrs. 9 min., nearly.

20. 5 hrs. 29 min.

21. 4.4 miles.

22. (a) 1826 ft.; (b) 91.3 ft.; (c) 1,013 1-3.

23. (a) compass course N by E ¾ E; (b) 2.1 miles; (c) port a quarter of a point—3° if steering to degrees; (d) 4 miles from Pilot Island; (e) port a point; (f) compass course NNE ⅝ E; (g) 5.9 miles; (h) 4 miles.

Example.—The vessel is steaming 12 miles an hour steering S ½ E; at 10 o'clock Port Sanilac bears abeam—W ½ S—and at 10:15 it bears 2½ points abaft the beam—WNW; how far is the ship from the light at 2d bearing? Answer, 6 miles, Twice the distance run is the distance the ship is from the light. This is the Dodge bearing used abeam and 2½ points abaft the beam; twice the distance run being the distance from the object. This is a very serviceable bearing, and can be employed to advantage in many cases. The distance from the object at 2d bearing represents the hypotenuse of a right-angled triangle, in which the bearing abeam is the perpendicular and the course the base, the base being just one-half the hypotenuse, so that in doubling it we get the length of the hypo.

Ex.—You are logging 12½ miles an hour, and at 9 o'clock Point aux Barques bore 37° on the bow, and at 9:45 it bore abeam. Required the distance from the light when abeam. Ans. 7 miles (9.37 × .75).

Bear in mind that it is only the scalene and cross-bearings that have to be plotted on the chart, in order to find the ship's place.

How to correct these compass bearings to turn them into their corresponding true bearings, so that when they are traced on the chart they will agree therewith:

The ship is steering NE at the time a lighthouse bore NW by N and at the same time a point of land bore W½N by compass. The Dev. for NE ¾-pt. Ely. and the Var. at place of ship is ¼-pt. Ely.

Lighthouse.

Compass bearing NW by N =	3 pts. L [of N
Deviation Ely	¾ pts. R
Correct Magnetic bearing	2¼ pts. L [of N
Variation Ely	¼ pts. R
True Bearing	2 pts. L [of N or [NNW

Point of Land.

Compass bearing W½N =	7½ pts. L [of N
Deviation Ely	¾ pts. R
Correct Magnetic bearing	6¾ pts. L [of N
Variation Ely	¼ pts. R
True Bearing	6½ pts. L [of N or [WNW [½W

The true course the vessel is steering is NE by E. This can all be done mentally. Remember that in plotting any kind of a bearing on a chart if it is taken by compass you must allow for the Dev. and Var. to make it true so that it will agree with the chart. In a case of this kind, remember that Dev. and Var. Ely allow to the right of the bearing by compass, and Dev. and Var. Wly allow to the left of the bearing by compass. The best way to do this is to set the Pelorus to the true course that the vessel is steering, and then all bearings taken by it will be true bearings, and they need no further correction, but can be laid right on the chart. Thus, in the above case the vessel is steering NE by compass, but the true course is NE by E; if the Pelorus were set to this course and the lighthouse and point of land taken, the bearings would be identical with those corrected for the Dev. and Var. This is another wrinkle worth knowing.

FOUND GEOGRAPHICALLY.

It must be plainly seen that these various methods of one object bearings are formed by various triangles of different descriptions, and that they are computed by geographically finding two sides of the triangle where the third side and two angles are known; and it must also be clear that the correct solution of the problem in every case depends on the course and distance made good over the ground, and not merely the course steered by compass and the distance run by log, both of which ignores current and leeway, and in consequence could be in error on this account. The vessel although steering the same constant course can actually be carried to one side or the other of her course by these agencies. If in the direction of the course made good a shoal or reef is found, and the vessel maintains her course, stranding is certain to occur.

TIME AND SPEED TABLE.

The following table shows the number of minutes and seconds that are required for the ship to make various speeds. The speed is given from 5 to 18 miles an hour, and will answer for the purpose intended. We have added this table merely to help the learner prove his work, and it is not intended that he should work from the table alone, but use it as a proof after he has worked the example relating thereto:

Speed Per Hour. Miles.	Time Per Mile. Min.	Sec.	Minutes and Decimal of a Minute Per Mile.
5	12		
5¼	11	26	11.4
5½	10	54	10.9

5¾	10	26	10.4
6	10		
6¼	9	36	9.6
6½	9	14	9.2
6¾	8	53	8.9
7	8	34	8.6
7¼	8	16	8.3
7½	8		7.7
7¾	7	44	7.5
8	7	30	7.3
8¼	7	16	7.1
8½	7	3	6.8
8¾	6	51	6.7
9	6	40	6.6
9¼	6	29	6.5
9½	6	19	6.3
9¾	6	9	6.1
10	6		
10¼	5	51	5.8
10½	5	43	5.7
10¾	5	35	5.6
11	5	27	5.4
11¼	5	20	5.3
11½	5	13	5.2
11¾	5	6	5.1
12	5		
12¼	4	54	4.9
12½	4	48	4.8
12¾	4	42	4.7
13	4	37	4.6
13¼	4	31	4.5
13½	4	26	4.44
13¾	4	22	4.36
14	4	17	4.28
14¼	4	13	4.2
14½	4	8	4.13
14¾	4	4	4.06
15	4		
15¼	3	56	3.93
15½	3	52	3.87
15¾	3	48	3.8
16	3	45	3.75
16¼	3	41	3.69
16½	3	38	3.63
16¾	3	35	3.58
17	3	32	3.53
17¼	3	29	3.48
17½	3	26	3.43
17¾	3	23	3.38
18	3	20	3.33

GET ACQUAINTED WITH SIMPLE PROPORTION.

The student should understand Simple Proportion; he must already see its importance. A knowledge of it will facilitate the work of finding the distance from the time that the ship has run between bearings, and it will also do away with the long operations of ordinary Arithmetic.

SOLUTIONS OF PLANE RIGHT-ANLED TRIANGLES.

The following table shows the length of the perpendicular and base for a given hypotenuse, or vice versa, for angles of from ¼ point to 4 points of the compass. The length of the hypotenuse are given for from 5 to 20 miles, which will answer for the purposes intended:

Angle of ¼-Pt.			Angle of ½-Pt.			Angle of ¾-Pt.		
Hypo	Perp	Base	Hypo	Perp	Base	Hypo	Perp	Base
5	5.0	0.2	5	5.0	0.5	5	4.9	0.7
6	6.0	0.3	6	6.0	0.6	6	5.9	0.9
7	7.0	0.3	7	7.0	0.7	7	6.9	1.0
8	8.0	0.4	8	8.0	0.8	8	7.9	1.2
9	9.0	0.4	9	9.0	0.9	9	8.9	1.3
10	10.0	0.5	10	10.0	1.0	10	9.9	1.5
11	11.0	0.5	11	10.9	1.1	11	10.9	1.6
12	12.0	0.6	12	11.9	1.2	12	11.9	1.8
13	13.0	0.6	13	12.9	1.3	13	12.9	1.9
14	14.0	0.7	14	13.9	1.4	14	13.8	2.1
15	15.0	0.7	15	14.9	1.5	15	14.8	2.2
16	16.0	0.8	16	15.9	1.6	16	15.8	2.3
17	17.0	0.8	17	16.9	1.7	17	16.8	2.5
18	18.0	0.9	18	17.9	1.8	18	17.8	2.6
19	19.0	0.9	19	18.9	1.9	19	18.8	2.8
20	20.0	1.0	20	19.9	2.0	20	19.8	2.9

Angle of 1-Pt.			Angle of 1¼-Pt.			Angle of 1½-Pt.		
Hypo	Perp	Base	Hypo	Perp	Base	Hypo	Perp	Base
5	4.9	1.0	5	4.9	1.2	5	4.8	1.5
6	5.9	1.2	6	5.8	1.5	6	5.7	1.7
7	6.9	1.4	7	6.8	1.7	7	6.7	2.0
8	7.8	1.6	8	7.8	1.9	8	7.7	2.3
9	8.8	1.8	9	8.7	2.2	9	8.6	2.6
10	9.8	2.0	10	9.7	2.4	10	9.6	2.9
11	10.8	2.1	11	10.7	2.7	11	10.5	3.2
12	11.8	2.3	12	11.6	2.9	12	11.5	3.5
13	12.8	2.5	13	12.6	3.2	13	12.4	3.8
14	13.7	2.7	14	13.6	3.4	14	13.4	4.1
15	14.7	2.9	15	14.6	3.6	15	14.4	4.4
16	15.7	3.1	16	15.5	3.9	16	15.3	4.6
17	16.7	3.3	17	16.5	4.1	17	16.3	4.9
18	17.7	3.5	18	17.5	4.4	18	17.2	5.2
19	18.6	3.7	19	18.4	4.6	19	18.2	5.5
20	19.6	3.9	20	19.4	4.9	20	19.1	5.8

Angle of 2 Pts.			Angle of 3-Pts.			Angle of 4-Pts.		
Hypo	Perp	Base	Hypo	Perp	Base	Hypo	Perp	Base
5	4.6	1.9	5	4.2	2.8	5	3.5	3.5
6	5.5	2.3	6	5.0	3.3	6	4.2	4.2
7	6.5	2.7	7	5.8	3.9	7	4.9	4.9
8	7.4	3.1	8	6.7	4.4	8	5.7	5.7
9	8.3	3.4	9	7.5	5.0	9	6.4	6.4
10	9.2	3.8	10	8.3	5.6	10	7.1	7.1
11	10.2	4.2	11	9.1	6.1	11	7.8	7.8
12	11.1	4.6	12	10.0	6.7	12	8.5	8.5
13	12.0	5.0	13	10.8	7.2	13	9.2	9.2
14	12.9	5.4	14	11.6	7.8	14	9.9	9.9
15	13.9	5.7	15	12.5	8.3	15	10.6	10.6
16	14.8	6.1	16	13.3	8.9	16	11.3	11.3
17	15.7	6.5	17	14.1	9.4	17	12.0	12.0
18	16.6	6.9	18	15.0	10.0	18	12.7	12.7
19	17.6	7.3	19	15.8	10.6	19	13.4	13.4
20	18.5	7.7	20	16.6	11.1	20	14.1	14.1

THE TRAVERSE TABLES.

The foregoing tables are nothing more than a portion of the data contained in the traverse tables, which by mere inspection the navigator, in sailing vessels on the ocean, employes for working out his dead reckoning. By such tables the solution of right-angled triangles is accomplished by mere inspection. In the regular traverse tables "Dist." (distance) is substituted for Hypo (hypotenuse); "Lat." (meaning difference of latitude, north or south) for Perp (perpendicular), and Dep. (departure eastings or westings) for base; that is, hypo represents the distance; perp the meridian, and base a parallel on the chart. For example:

DIFF. LAT. AND DEP.

Supposing that you steered NE by N 15 miles, what is the diff. of lat. and dep., that is, what distance has the vessel made north and east while sailing constantly on a NE by N course for 15 miles. As NE by N is a 3-point course, look for angle of 3-points in the above table and against 15 in hypo. column will be found 12.5 in perp. column and 8.3 in base column, which means that to sail NE by N 15 miles the vessel changes her latitude 12.5 minutes or nautical miles, and her dep. 8.3 minutes or nautical miles; or she makes 12.5 nautical miles in the direction of north or 12.5 miles of northing and 8.3 in the direction of east, or 8.3 miles of easting, in sailing 15 miles NE by N. This holds good for any 3-point course, and also for the complement of a 3-point course, or a 5-point course, by assuming the base to be the perpendicular and the perpendicular to be the base under angle of 3-points. For example: supposing the course was 15 miles NE by E, which is a 5-point course, the vessel would make 12.5 miles of easting and 8.3 miles of northing. This is plain for when the course is more than 4 points the dep. is greater than the diff of latitude, because we go more east or west than north or south. We can also see that the relations of the two elements are simply reversed. See diagrams. In a 5-point course, the diff. of lat. is the same as the dep. in a 3-point course, the complement of a 3-pt. course (3 from 8 is 5, 8 being the right angle, or 90°, and the complement of an angle is what it lacks of being 8 points or 90°). Hence, in using the tables, as soon as you have a course of over 4 points, you begin at the bottom and read up, noting that while the dist. remains in the same place lat. and dep. are reversed; but this has nothing to do particularly in the manner in which we employ them in off-shore distance finding.

The following table will explain the system of the traverse tables. The above example is illustrated:

3-Point Course—NE by N.

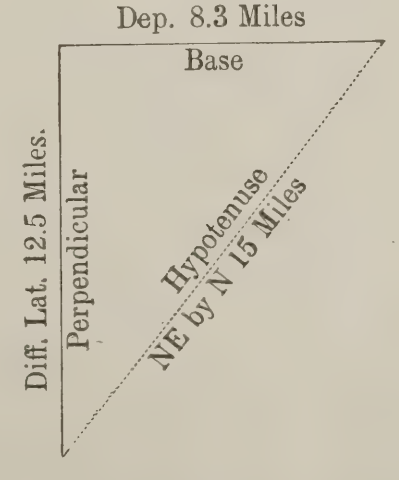
Dist.	Lat.	Dep.
15	12.5	8.3

5-Point Course—NE by E.

Dist.	Dep.	Lat.

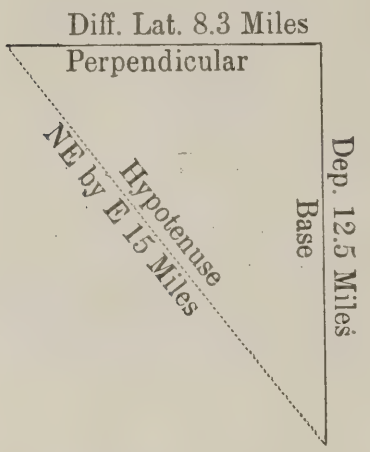
SMALL SECTIONS OF THE EARTH FLAT.

These tables are on the assumption that small sections of the earth's surface are flat. and so they are for



all practical purposes of navigation. Then, it is plain to be seen that the

whole matter resolves itself into the solution of right-angled triangles. A glance at any sailing chart which has the courses printed on it will show at once that any course unites with the parallels and meridians in forming series of right-angled triangles. The only cases in which no such triangles exist are those of east and west and north and south. In the



latter case whatever distance the vessel sails in nautical miles represents minutes of latitude. In the case of east and west the matter is not so simple, because only on the equator are a nautical mile and a minute of longitude the same thing. But by means of the table on page 211, which contains the number of miles in a degree of longitude at every distance

north or south of the equator—which means in every latitude—we can easily find the longitude. For instance, a ship in Lat. 42° N sails true east 100 miles; how much does she alter her longitude? A degree of long. in lat. 42° measures 44.7 nautical miles, nearly; hence, she changes her long. by 2° 13′ 48″. On the parallel of 60° a degree of longitude measures 30 miles, so that for every 30 miles sailed east or west the long. is changed 1°. In the above example to sail 100 miles on this parallel the vessel would change her long. by 3° 20′. If a vessel by sailing either east or west on the parallel of 60° changes her long. 5°, how many miles has she had to sail in order to do it ? 5×30=150 miles.

This same information is contained in the hypo., perp. and base tables, but in order to show it we will have to assume examples that will conform to the table on account of its extreme small limits, as compared with distances on the globe. The above tables are intended for these purposes, but in order to show some of the many things that can be performed by means of them we mentioned this one, hence the student that is desirous of further information on the subject will know how to go ahead in order to accomplish it.

Supposing a vessel on the parallel of 45° sails 14.1 knots, how many

minutes has she changed her longitude, that is, minutes of arc. Rule.—With the latitude of the parallel as a course (the angle in the table) and the distance sailed as perp. enter the above table and the corresponding hypo. will be the diff. of long. required.

FOUR LAKE LAUNCHINGS.

(Continued from page 29.)

15 ft. in diameter and 11 ft. 6 in. long. She is built on the girder system and her hull construction is unusually rigid. In the line of auxiliaries she will have the Akers emergency steam steering gear, which is coming to be regarded by competent vessel owners as an indispensable auxiliary on these great steamers. She will have Hyde steering gear and windlass and Chase mooring engines. Her dynamos will be of the General Electric Co.'s type. Her ballast and feed pumps will be of the Warren type. Her hatch covers will be canvass treated with Preservo. Her construction is under the supervision of Nacey & Hynd, naval architects of Cleveland.

Capt. Thomas Deringer will bring the Munro out and Frank Trinkwater will be her chief engineer.

The steamer, Wm. A. Hawgood, building for the Atlas Steamship Co., Cleveland, was launched at the South Chicago yard of the American Ship Building Co. last Saturday. Miss Arlae Hawgood, daughter of Wm. A. Hawgood, christened the vessel. Quite a delegation from Cleveland attended the launching. The Hawgood is 552 ft. over all, 532 ft. keel, 56 ft. beam and 31 ft. deep. She will have thirty-two hatches, spaced 12 ft. centers. Her engines will be triple-expansion engine, with cylinders 23½, 38 and 63 in. diameters by 42-in. stroke, supplied with steam from Scotch boilers, 14 ft. 6 in. by 11 ft. 6 in., equipped with Ellis & Eaves draft and allowed 180 lbs. pressure. She will carry 10,000 tons. Capt. Wm. D. Ames of Cleveland will be master of the Wm. A. Hawgood and George Robbins will be chief engineer.

The steamer Adriatic was launched at the Lorain yard of the American Ship Building Co. on Saturday, and was christened by Miss Louise Latimer of Cleveland. The Adriatic is the fifth of the eight new steamers for the Lackawanna fleet to be launched at Lorain. The Adriatic is a duplicate of the steamer Cyprus which was lost on Lake Superior two weeks ago, and is therefore 440 ft. over all, 420 ft. keel, 52 ft. beam and 28 ft. deep. She has twenty-three hatches spaced 12 ft. centers. Her machinery will consist of triple-expansion engines, 22, 35 and 58 in. diameter by 42 in. stroke, and Scotch boilers, 13 ft. 9 in. by 11 ft. 6 in., equipped with Ellis & Eaves draft and allowed a working pressure of 180 lbs. Her carrying capacity will be 7,000 tons. She will be completed in about three weeks.

The freighter steamer H. P. Bope, building for the Standard Steamship Co., of which A. B. Wolvin, of Duluth, is manager, was launched from the West Superior yard of the American Ship Building Co. on Saturday last and was christened by Miss Laura E. Bope, of Pittsburg, daughter of H. P. Bope. The new steamer is 552 ft. over all, 532 ft. keel, 56 ft. beam and 30 ft. deep, having thirty-two hatches, spaced 12 ft. centers. Her engines are quadruple-expansion with cylinders 18½, 28½, 43½ and 66 in. diameters by 42 in. stroke supplied with steam from Babcock & Wilcox boilers.

ATLANTIC COAST GOSSIP

Office of MARINE REVIEW,
1005 West Street Bldg.,
New York City.

The new Anchor Line steamship California, which sailed from Glasgow and Movile on October 12, arrived at her berth in New York on Monday morning. She had a full passenger list for her maiden trip, and is commanded by Capt. John Blaikie, formerly of the Furnessia.

The California is of 10,000 tons, and has accommodation for 300 saloon, 400 second cabin, and 800 third class passengers. She is divided into nine watertight compartments, has six decks, and is propelled by two sets of triple expansion engines. She averaged 17½ knots on her trial trips, but is built for an average speed of about 16 knots.

Goodman Phillips and James B. Lehneman appeared in the United States District Court at Boston, on the 18th, and retracted their former plea of not guilty and pleaded guilty of conspiracy in connection with the smuggling of Chinamen into Providence on the schooner yacht Frolic. By agreement between counsel sentence was deferred.

The Cunard liner Umbria arrived at New York on Sunday on her last trip, for an indefinite period, between Liverpool and New York. The Lucania will take her place in the service. On her last eastbound trip the Cunarder encountered heavy weather, and suffered no little damage. This westbound trip she again ran into a spell of rough seas lasting four days, her wireless apparatus being temporarily disabled through the breaking of a topmast.

A fire which started in the hold of the German steamer Gunther, lying at the Bush Terminal Stores in Brooklyn, did some $2,000 damage to ship and cargo before the blaze was extinguished.

The Gunther is owned by the Hamburg-American Line and is in the Brazilian service. She arrived at New York from Santos and Barbadoes on Oct. 11.

The all-water cable of the Commercial Cable Co. to Havena, has been spliced, and is now a complete connection between New York and Cuba. The New York shore end is at Coney Island.

The North German Lloyd will assume exclusive control on January 1 of the Mediterranean-Levant service, heretofore conducted in connection with the German Levant Line.

The British steamship Earl of Douglass, from Victoria, British Columbia, is bound for New York or Philadelphia with the largest cargo of lumber ever brought from the Pacific coast to the East. She left Coronel on Sept. 28.

The schooner Glad Tidings foundered off St. Andrew, Fla., while on her way from Baltimore to Ferdinanda with a cargo of coal, all of the crew being saved.

The Glad Tidings for many years was in the Baltimore-Brazil coffee fleet, and was then one of the best known square-rigged vessels afloat.

It is reported from Staten Island that a piece of land sold last Friday at Tottenville has been bought by the Southern Ship Building Co. of Jacksonville, Fla., to be used for a large ship building plant. The plot has a waterfront of 700 ft. on Staten Island Sound.

The Southern Ship Building Co. has a large plant at Jacksonville, and it is said to be the intention of the company to remove this plant, with considerable additions, to the Staten Island site.

Gold to the amount of $1,500,000 was engaged at the Assay office, New York, last Saturday, for shipment to Germany. It was taken by Muller, Schall & Co., and leaves per mail steamer this week.

The Verdi, a new steamer for the Lamport & Holt Line to South America, will make her maiden voyage from New York on Jan. 20. She will be an 11,000-ton steamer with an average speed of about fourteen or fifteen knots, and will have all the latest improvements to meet the requirements of the increased passenger trade to South America.

The men of the fire department in South Brooklyn, New York, are protesting against the habit of certain terminal companies keeping their docks and wharfs blocked with freight thereby hindering the approach of the engines with fire wagons. It is pointed out that during a recent fire aboardship the fireboat Seth Low fought the blaze for one hour before it was extinguished, the land companies having to stand idly by their apparatus as it was impossible to get it on the scene of action.

Arthur Daken, a Marconi operator employed at the South Wellfleet, Mass., station, was found dead in the operating room. Medical Examiner Curley believes that Daken, who was alone, received a charge of 35,000 volts of electricity while conducting experiments on his own account and in which he accidentally short-circuited the current.

Col. Robert M. Thompson, who has chartered the liner Mineola for a tour 'round the world, says the accounts circulated of his plans are greatly exaggerated. It is his intention to have a few personal friends with him, to travel by way of the Suez Canal, and to be gone about six months.

The steamer Sarnia, of the Atlas Line, arrived from Port Limon, Fortune Islands, and other ports on the Caribbean sea, with a broken high pressure piston. The accident happened when the vessel was leaving Cartagena on October 2, the voyage of 2,500 miles being accomplished on the remaining intermediate and low pressure cylinders.

General Manager Ballin of the Hamburg-American Line has stated that the company has no intention of attempting to regain the blue ribbon captured by the Lusitania. He declares that ships of the Lusitania type can only be constructed with government aid, and advocates his theory that teight or 10-day boats are the real dividend payers, besides supplying the maximum comfort.

On account of their fast time between Queenstown and New York, the two new Cunard liners will receive from the United States government from $4,000 to $6,000 for carrying United States mail destined to Europe each voyage. No contract to this effect is necessary, as the rate to be paid—35 cents per pound—is fixed by arrangement between the postal authorities of America and Europe.

Capt. Jensen, of the steamer Admiral Schley, reported the lack of activity of the Gulf stream and the temperature far below normal, on his arrival at Philadelphia from Port Antonio.

BIDS FOR NAVAL SUPPLIES.

Bids received at the Bureau of Supplies and Accounts, Navy Department, for material and Supplies, opened Oct. 8, included the following:

Schedule 334.—Yards and Docks.

Class 36—Pensacola—Two Automatic Check Valves.

Bridgeman Bros. Co., 1426 Washington Ave., New York $190.00
Lunkenheimer Co., Cincinnati, O..... 220.00
Manhattan Supply Co., 127 Franklin St., New York 246.00
Berry & Aiken, 36th and Wharton Sts., Philadelphia, Pa. 298.00
Crane Co., 519 S. Canal St., Brooklyn, N. Y. 352.80
Excelsior Equipment Co., Frick Bldg., Pittsburg, Pa. 213.20
E. F. Keating Co., 452 Water St., New York 210.00
Manning, Maxwell & Moore, 85 Liberty St., New York 184.00
Vermilye & Power, 17 Battery Pl., New York 193.96
Central Metal & Supply Co., 609 E. Lobbard St., Baltimore, Md..... 200.00

Class 37—Pensacola—Check and Gate Valves.

Chapman Valve Mfg. Co., Indian Orchard, Mass. $43.56
Fairbanks Co., New Orleans, La..... 49.08
Lunkenheimer Co., Cincinnati, O..... 48.80
E. F. Keating Co., 452 Water St., New York 58.00

Schedule 348.—Navigation.

Class 76—Annapolis—Fifty Surveying Sextants.

Bausch-Lomb-Saegmuller Co., Rochester, N. Y. $4,500.00
Keuffel & Esser Co., Hoboken, N. J.... 3,600.00

Class 77—Annapolis—50 Artificial Horizons.

Bausch-Lomb-Saegmuller Co., Rochester, N. Y. $1,500
Keuffel & Esser Co., Hoboken, N. J..... 1,100
Queen & Co., 807 Arch St., Philadelphia, Pa. 1,125

Class 78—Annapolis—Parallel Rules, Compass Reader, Barometers, etc.

Keuffel & Esser, Hoboken, N. J..... $56.66
J. B. Roache, 350 Fulton St., Brooklyn, N. Y. 69.00

Schedule 349—Ordnance.

Class 110—Washington—Brass Globe and Gate Valves.

Bridgeman Bros. Co., 1426 Washington Ave., New York $408.10
Chesapeake Supply Co., Washington, D. C. 518.71
Chapman Valve Mfg. Co., Indian Orchard, Mass. 175.08
Fairbanks Co., Baltimore, Md..... 259.74
Hartman Co., 1235 N. Front St., Philadelphia, Pa. 422.34
Manhattan Supply Co., 127 Franklin St., New York 259.21
William Powell Co., 2525 Spring Grove Ave., Cincinnati, O..... 663.44
Thomas Summerville Co., Washington, D. C. 505.91
Crane Co., 519 So. Canal St., Brooklyn, N. Y. 425.01
Cuyler & Mohler, 611 William St., Baltimore, Md. 407.08
E. F. Keating Co., 452 Water St., New York 262.80
Central Metal & Supply Co., 609 E. Lombard St., Baltimore, Md..... 543.24

Class 111—Washington—36 Brass Compression Bibbs and 48 Brass Cocks.

Chesapeake Supply Co., Washington, D. C. $60.90
Manhattan Supply Co., 127 Franklin St., N. Y. 51.96
Thomas Sommerville, Washington, D. C.. 53.76
A. B. Sands & Sons Co., 22 Vesey St., New York 61.44
Crane Co., 519 So. Canal St., Brooklyn, N. Y. 45.20
Cuyler & Mohler, 611 William St., Baltimore, Md. 74.04
E. F. Keating Co., 452 Water St., New York 58.44
Montgomery & Co., 105 Fulton St., New York 74.40
Central Metal & Supply Co., 609 E. Lombard St., Baltimore, Md..... 51.48

Class 112—Washington—Pipe Fittings.

Bridgeman Bros. Co., 1426 Washington Ave., New York $134.80
Chesapeake Supply Co., Washington, D. C. 203.12
Manhattan Supply Co., 127 Franklin St., New York 113.22
Thomas Sommerville Co., Washington, D. C. 143.46
Crane Co., 519 So. Canal St., Brooklyn, N. Y. 119.15
Cuyler & Mohler, 611 William St., Baltimore, Md. 134.42
E. F. Keating Co., 452 Water St., New York 138.86
Central Metal & Supply Co., 609 E. Lombard St., Baltimore, Md..... 122.23

Schedule 350—Ordnance.

Class 125—Newport—600 Tripod Rods and Mooring Blocks.

Duplex Boiler Bushing Co., Belfast, Me. $1,182
Newport Engineering Co., Newport, R. I. 948
New Jersey Foundry & Machine Co., 9 Murray St., New York 396
Berry & Aiken, 36th & Wharton Sts., Philadelphia, Pa. 1,194
G. & W. Mfg. Co., 26 Cortlandt St., New York 840

Class 154—Norfolk—11,000 lbs. Condenser Tubes.

A. P. Swoyer Co., 17 N. 7th St., Philadelphia, Pa. $2,746.70
Benedict & Burnham Mfg. Co., 99 John St., New York 3,025.00
National Brass & Copper Tube Co., 41 Park Row, New York 2,746.70
Central Metal & Supply Co., 609 E. Lombard St., Baltimore, Md..... 2,970.00

and Mackinaw on Wednesdays and Saturdays also. The daily service beween Detroit and Cleveland will be continued until Dec. 1. The daily service between Detroit and Buffalo will be continued until Nov. 10.

The American Sawdolet Co., 902 Park building, Cleveland, is meeting with considerable success in installing its flooring upon lake steamers. So far the following steamers have been equipped with it: The L. S. DeGraff, 2,722 sq. ft.; the W. M. Mills, 2,722 sq. ft.; the Jay C. Morse, 2,536 sq. ft.; the Odanah, 2,250 sq. ft.; the Cyprus, 2,260 sq. ft.; the Crete, 2,261 sq. ft.; the J. J. Sullivan, 3,732 sq. ft.

WHARF AT GRAY'S HARBOR.

Abstract of proposals received by Maj. H. M. Chittenden, Corps of Engineers, United States Army, for constructing wharf and trestle at Gray's Harbor, Wash., received in response to advertisement dated Aug. 15, 1907. Opened Aug. 30, 1907.

Items	Quantities.	(1) International Contract Co. Seattle, Wash. Bid.	(1) Amount.	(2 Gray's Harbor Construction Co. Hoquiam, Wash. Bid.	(2 Amount.
Piles	57,000 lin. ft.	$ .19 6/10	$11,172.00	$ .17¼	$ 9,832.50
Lumber, rough	600,000 ft. B. M.	33.00	19,800.00	18.00	10,800.00
Lumber, dressed	120,000 ft. B. M.	35.00	4,200.00	18.50	2,220.00
Iron	8,000 lbs.	.06	480.00	.03½	280.00
Spikes	5,000 lbs.	.06	300.00	.03¼	162.50
Totals			$35,952.00		$23,295.00

JETTIES BROADKILL RIVER.

Abstract of proposals received in response to advertisement attached hereto, by Maj. C. A. F. Flagler, Corps of Engineers, U. S. Army, Wilmington, Del., opened Aug. 28, 1907, for jetty construction at new mouth of Broadkill river, Delaware.

No.	Name and Address of Bidders.	For construction of jetty. Section 1 at per linear ft. 230 ft.	Section 2 at per linear ft. 500 ft.	Section 3 at per linear ft. 650 ft.	Total.
*1	Latta & Terry Construction Co., Philadelphia, Pa.	$20.20	$ 8.00	$11.35	$16,023.50
2	Richard Parrott, Newburgh, N. Y.	22.00	10.50	11.00	17,460.00
3	Tatnall-Brown Co., Wilmington, Del.	25.75	9.75	12.35	18,825.00
4	Armstrong & Latta Co., Philadelphia, Pa.	100.54	20.96	35.39	56,607.70
5	Franklin K. Wills Co., Wilmington, Del.	24.50	9.50	10.20	17,015.00

*Accepted.

BIDS FOR LUMBER.

Abstract of bids received in response to advertisement dated Aug. 10, 1907, and opened by Major C. S. Riche, Corps of Engineers, at Rock Island, Ill., at 2 P. M., Sept. 10, 1907, for furnishing and delivering free on board cars 2,624,616 feet, B. M., fir lumber.

No.	Name and address of bidder.	Amount.
1	Allen & Nelson Mill Co., Seattle, Wash.	*$37,123.11
2	H. B. Waite Lumber Co., Minneapolis, Minn.	50,307.66
3	Lumber Manufacturers' Agency, Centralia, Wash.	46,234.68
4	Allen Sherman Lbr. Co., Littlerock, Wash. (for 1,262,371 ft.)	20,795.25
5	Union Lumber Co., Tacoma, Wash.	59,053.86
6	Great Western Lumber & Timber Co., Aberdeen, Wash.	42,335.05
7	Foster Lumber Co., Tacoma, Wash. (for 2,615,869 ft.)	51,308.39
8	Arthur Gamwell, Seattle, Wash.	52,497.01
9	Carstens & Earles, Inc., Seattle, Wash.	44,417.30
10	Tacoma Mill Co., Tacoma, Wash.	46,260.03
11	The Sound Lumber Co., Seattle, Wash.	48,555.40
12	C. M. McCoy, Minneapolis, Minn.	51,394.43
13	St. Paul & Tacoma Lumber Co., Tacoma, Wash.	62,990.78
14	Somerville Bros., Napavine, Wash.	54,367.13

*Recommended for acceptance.

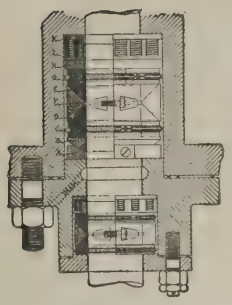
BIDS FOR DREDGING AT NORFOLK, VA.

Bids received by Maj. J. E. Kuhn, Corps of Engineers, U. S. Army, Norfolk, Va., for dredging harbor at Norfolk, opened Sept. 4, were as follows:

Bidder.	Sec. A. 150,000 cu. yds. per cu. yd.	Sec. B. 1,800 cu. yds. per cu. yd.	Sec. C. 200,000 cu yds. per cu. yd.	Sec. D. 75,000 cu. yds. per cu. yd.	Aggregate of bids.
River & Harbor Improvement Co., Philadelphia, Pa.	.14	$1.50	.13 8/10	.25	$70,050
L. M. Lewis, Norfolk, Va.	.10 8/10	4.00	.11 1/2	.16 1/2	58,775
Coastwise Dredging Co., Norfolk, Va.	.10 7/10	4.00	.10 3/10	.18	57,350
Norfolk Dredging Co., Norfolk, Va.	.09 4/10	1.75	.10 4/10	.21 1/2	54,175

Sections A, C and D cover dredging; section B covers removing old bridge approach.

The steamers on the Mackinaw division of the Detroit & Cleveland Navigation Co. leave Toledo northbound on Mondays and Thursdays, and from Detroit on Mondays and Fridays; southbound they leave St. Ignace on Wednesdays and Saturdays



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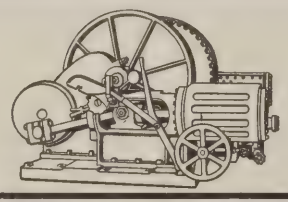
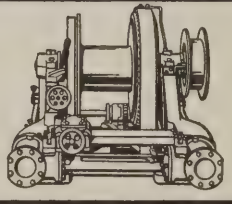
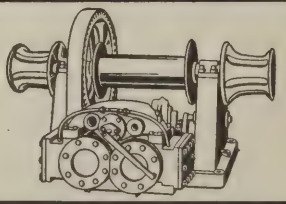

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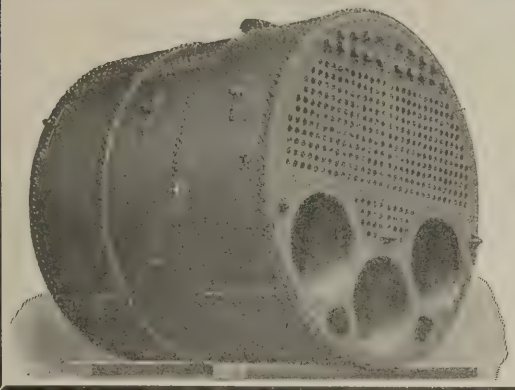

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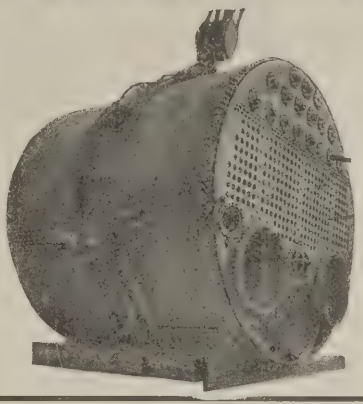

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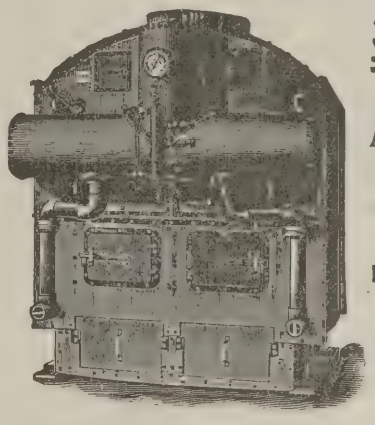

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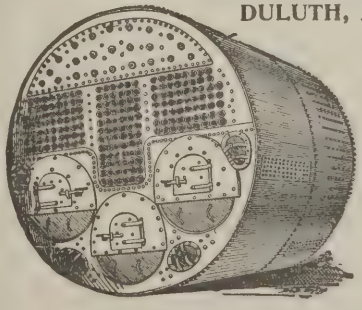

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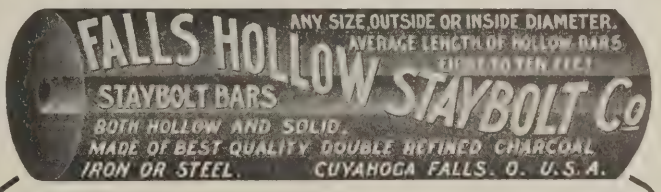
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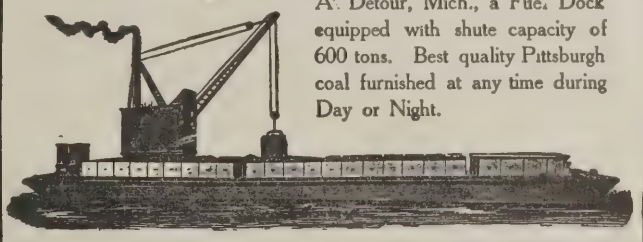

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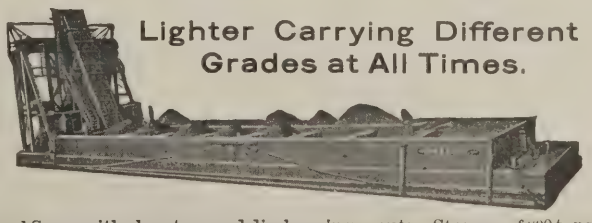

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Superior Ship Building Co.....Superior, Wis.
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Toledo Fuel Company....Toledo, O.

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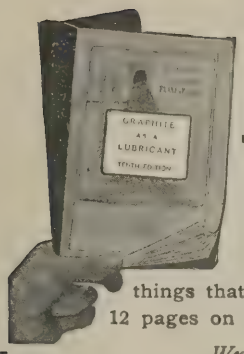

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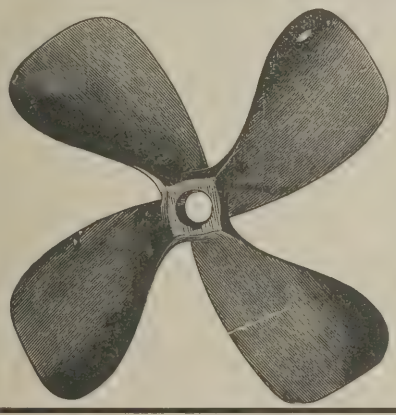

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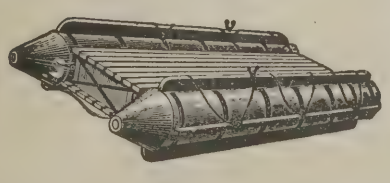

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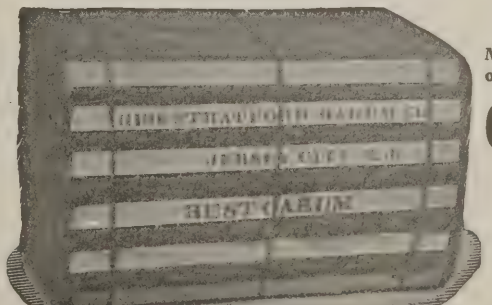

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Plate, Arch Girder, Spar Deck Beams, and Side Tanks, Where Hold Beams ensed With.

CONNECTING ANGLES.			TANK TOP STIFFENERS		TANK TOP PLATING.				
ertical Stiffeners necting ons with el Floors	Angle Lugs Connecting Floors and their Intercostal Plates	Angles Connecting Continuous Side Keelsons to Deep Floors	Tank Top Seam Straps	Transverse Stiffening Angles Between the Seam Straps Spaced 18 ins.	Plating within the Cargo Space or in way of Hatches	Plating in Engine Room		Margin Plates Through-out the Tank Top	Plating For-ward of Cargo Space
						Tank Top	Engine Bed		
lbs.	ins. lbs.	ins. lbs.	ins. lbs.	ins. lbs.	lbs.	lbs.	lbs.	ins. lbs.	lbs.
9*	10†	11	12	13	14	15	16	17	18
3 x 6.6	4 x 3 x 7.1	3 x 3 x 6.1	9 x 16	3 x 3 x 6.1	16	15	17	42 x 14	14
3 x 6.6	4 x 3 x 7.1	3 x 3 x 6.1	9 x 16	3 x 3 x 6.1	16	15	17	42 x 14	14
3 x 6.6	4 x 3 x 7.1	3 x 3 x 6.1	9 x 17½	3 x 3 x 6.1	16	15	17	42 x 14	14
3 x 6.6	4 x 3½ x 7.7	3 x 3 x 6.1	9 x 17½	3 x 3 x 6.1	17	16	17	50 x 15	15
3 x 6.6	4 x 3½ x 7.7	3 x 3 x 6.1	9 x 17½	3 x 3 x 6.1	17	16	17	50 x 15	15
x 7.1	4 x 3 x 8.5	3 x 3 x 7.2	9 x 17½	3 x 3 x 7.2	17	16	17	50 x 15	15
x 7.1	4 x 3 x 8.5	3 x 3 x 7.2	9 x 19	3 x 3 x 7.2	18	17	18	60 x 16	16
x 7.1	4 x 3 x 8.5	3 x 3 x 7.2	9 x 19	3 x 3 x 7.2	18	17	18	60 x 16	16
x 7.1	4 x 3 x 8.5	3 x 3 x 7.2	9 x 19	3 x 3 x 7.2	18	17	18	60 x 16	16
x 7.1	4 x 3 x 8.5	3 x 3 x 7.2	9 x 20	3 x 3 x 7.2	20	18	20	60 x 16	18
x 8.5	5 x 3 x 9.8	3 x 3 x 7.2	9 x 20	4 x 3 x 8.5	20	18	20	70 x 18	18
x 8.5	5 x 3 x 9.8	3 x 3 x 7.2	9 x 20	4 x 3 x 8.5	20	18	20	70 x 18	18
x 8.5	5 x 3 x 9.8	3 x 3 x 7.2	9 x 20	4 x 3 x 8.5	20	18	20	70 x 18	18
x 8.5	5 x 3 x 9.8	3½ x 3½ x 8.5	9 x 20	4 x 3 x 8.5	20	18	20	80 x 18	18
x 8.5	5 x 3 x 9.8	3½ x 3½ x 8.5	9 x 20	4 x 3 x 8.5	20	18	20	80 x 18	18
x 9.8	6 x 3½ x 11.7	3½ x 3½ x 8.5	9 x 20	4 x 3 x 8.5	20	18	20	80 x 18	18
x 9.8	6 x 3½ x 11.7	3½ x 3½ x 8.5	9 x 20	4 x 3 x 8.5	20	18	20	80 x 18	18
x 9.8	6 x 3½ x 11.7	3½ x 3½ x 8.5	9 x 20	4 x 3 x 8.5	20	18	20	80 x 18	18
x 9.8	6 x 3½ x 11.7	3½ x 3½ x 8.5	9 x 20	4 x 3 x 8.5	22½	20	22½	90 x 20	20
x 9.8	6 x 3½ x 11.7	3½ x 3½ x 8.5	9 x 25	5 x 3 x 9.8	22½	20	22½	90 x 20	20
x 10.2	6 x 3½ x 11.7	3½ x 3½ x 9.8	9 x 25	5 x 3 x 9.8	25	22½	25	90 x 22½	22½
x 10.2	6 x 3½ x 11.7	3½ x 3½ x 9.8	9 x 25	5 x 3 x 9.8	25	22½	25	90 x 22½	22½
x 10.2	6 x 3½ x 11.7	3½ x 3½ x 9.8	9 x 25	5 x 3 x 9.8	25	22½	25	90 x 22½	22½

top plating with angles given in the ninth column for vertical stiffeners.
l to shell and lugged to keelson plates with angles given in column 10.

TABLE F.

Center, and Side Girder Keelsons, and Their Connecting Angles, in Connection with Plate, Arch Girder, Spar Deck Beams, and Side Tanks, Where Hold Beams and Stanchions are Dispensed With.

	CENTER VERTICAL KEELSON PLATING AND CONNECTING ANGLES.				SIDE KEELSONS AND THEIR CONNECTING ANGLES.						TANK TOP STIFFENERS		TANK TOP PLATING.				
Length of Vessel Between Perp's	Weight and Depth of Center Keelson	Longitudinal Double Angles Connecting Keel & Keelson Plating	Longitudinal Double Angles Connecting Keelson & Tank-top Plating	Vertical Angles Connecting Floors and Center Keelson Plating	Weight of side Keelsons and their Intercost'l Plating	Spacing and Number of Side Keelson	Longitudinal Angles Connecting Side Keelsons with Floors and Tank-top	All Vertical Angle Stiffeners Connecting Keelsons with Channel Floors	Angle Lugs Connecting Floors and their Intercostal Plates	Angles Connecting Continuous Side Keelsons to Deep Floors	Tank Top Seam Straps	Transverse Stiffening Angles Between the Seam Straps Spaced 18 ins.	Plating within the Cargo Space or in way of Hatches	Plating in Engine Room		Margin Plates Throughout the Tank Top	Plating Forward of Cargo Space
														Tank Top	Engine Bed		
Feet	ins. lbs.	ins. lbs.	ins. lbs.	ins. lbs.	lbs.	No. Ins.	ins. lbs.	ins. lbs.	ins. lbs.	ins. lbs.	ins. lbs.	ins. lbs.	lbs.	lbs.	lbs.	ins. lbs.	lbs.
1	2	3	4	5	6	7	8	9*	10†	11	12	13	14	15	16	17	18
180	48 x 15	4 x 3 x 9.8	3 x 3 x 7.2	3 x 3 x 6.1	11	6 S. K. 48	3 x 3 x 6.1	3½ x 3 x 6.6	4 x 3 x 7.1	3 x 3 x 6.1	9 x 16	3 x 3 x 6.1	16	15	17	42 x 14	14
204	48 x 15	4 x 3 x 9.8	3 x 3 x 7.2	3 x 3 x 6.1	11	6 S. K. 48	3 x 3 x 6.1	3½ x 3 x 6.6	4 x 3 x 7.1	3 x 3 x 6.1	9 x 16	3 x 3 x 6.1	16	15	17	42 x 14	14
228	48 x 15	4 x 3 x 9.8	3 x 3 x 7.2	3 x 3 x 6.1	11	6 S. K. 48	3 x 3 x 6.1	3½ x 3 x 6.6	4 x 3 x 7.1	3 x 3 x 6.1	9 x 17½	3 x 3 x 6.1	16	15	17	42 x 14	14
252	48 x 17½	4 x 3 x 10.1	3½ x 3 x 7.8	3 x 3 x 7.2	13	6 S. K. 50	3 x 3 x 6.6	3½ x 3 x 6.6	4 x 3½ x 7.7	3 x 3 x 6.1	9 x 17½	3 x 3 x 6.1	17	16	17	50 x 15	15
276	48 x 17½	4 x 3 x 10.1	3½ x 3 x 7.8	3 x 3 x 7.2	13	6 S. K. 50	3 x 3 x 6.6	3½ x 3 x 6.6	4 x 3½ x 7.7	3 x 3 x 6.1	9 x 17½	3 x 3 x 6.1	17	16	17	50 x 15	15
300	48 x 17½	5 x 4 x 12.8	3½ x 3 x 7.8	3 x 3 x 7.2	13	6 S. K. 56	3 x 3 x 7.2	4 x 3 x 7.1	4 x 3 x 8.5	3 x 3 x 7.2	9 x 17½	3 x 3 x 7.2	17	16	17	50 x 15	15
324	48 x 17½	5 x 4 x 12.8	4 x 3 x 8.5	3 x 3 x 7.2	13	6 S. K. 56	3 x 3 x 7.2	4 x 3 x 7.1	4 x 3 x 8.5	3 x 3 x 7.2	9 x 19	3 x 3 x 7.2	18	17	18	60 x 16	16
348	54 x 19	5 x 4 x 12.8	4 x 3 x 8.5	3 x 3 x 7.2	15	6 S. K. 66	3 x 3 x 7.2	4 x 3 x 7.1	4 x 3 x 8.5	3 x 3 x 7.2	9 x 19	3 x 3 x 7.2	18	17	18	60 x 16	16
372	54 x 19	5 x 4 x 12.8	4 x 3 x 8.5	3 x 3 x 7.2	15	6 S. K. 66	3 x 3 x 7.2	4 x 3 x 7.1	4 x 3 x 8.5	3 x 3 x 7.2	9 x 19	3 x 3 x 7.2	18	17	18	60 x 16	16
396	54 x 19	5 x 4 x 14.5	4 x 3 x 8.5	3 x 3 x 7.2	15	6 S. K. 66	3 x 3 x 7.2	4 x 3 x 7.1	4 x 3 x 8.5	3 x 3 x 7.2	9 x 20	3 x 3 x 7.2	20	18	20	60 x 16	18
420	60 x 20	5 x 4 x 14.5	4 x 4 x 9.8	3½ x 3½ x 8.5	16	8 S. K. 62	3 x 3 x 7.2	4 x 3 x 8.5	5 x 3 x 9.8	3 x 3 x 7.2	9 x 20	4 x 3 x 8.5	20	18	20	70 x 18	18
444	60 x 20	5 x 4 x 14.5	4 x 4 x 9.8	3½ x 3½ x 8.5	16	8 S. K. 62	3 x 3 x 7.2	4 x 3 x 8.5	5 x 3 x 9.8	3 x 3 x 7.2	9 x 20	4 x 3 x 8.5	20	18	20	70 x 18	18
468	60 x 20	5 x 4 x 14.5	4 x 4 x 9.8	3½ x 3½ x 8.5	16	8 S. K. 62	3 x 3 x 7.2	4 x 3 x 8.5	5 x 3 x 9.8	3 x 3 x 7.2	9 x 20	4 x 3 x 8.5	20	18	20	70 x 18	18
492	60 x 22½	5 x 3½ x 15.2	4 x 4 x 9.8	3½ x 3½ x 8.5	16	8 S. K. 67	3 x 3 x 7.2	4 x 3 x 8.5	5 x 3 x 9.8	3½ x 3½ x 8.5	9 x 20	4 x 3 x 8.5	20	18	20	80 x 18	18
516	60 x 22½	5 x 3½ x 15.2	4 x 4 x 9.8	3½ x 3½ x 8.5	16	8 S. K. 67	3 x 3 x 7.2	4 x 3 x 8.5	5 x 3 x 9.8	3½ x 3½ x 8.5	9 x 20	4 x 3 x 8.5	20	18	20	80 x 18	18
540	60 x 22½	5 x 3½ x 15.2	4 x 4 x 9.8	4 x 3 x 9.8	16	8 S. K. 67	3 x 3 x 7.2	5 x 3 x 9.8	6 x 3½ x 11.7	3½ x 3½ x 8.5	9 x 20	4 x 3 x 8.5	20	18	20	80 x 18	18
564	60 x 22½	5 x 3½ x 15.2	4 x 4 x 11.3	4 x 3 x 9.8	16	8 S. K. 69½	3 x 3 x 7.2	5 x 3 x 9.8	6 x 3½ x 11.7	3½ x 3½ x 8.5	9 x 20	4 x 3 x 8.5	20	18	20	80 x 18	18
588	60 x 22½	5 x 4 x 16.2	4 x 4 x 11.3	4 x 3 x 9.8	17	8 S. K. 69½	3 x 3 x 7.2	5 x 3 x 9.8	6 x 3½ x 11.7	3½ x 3½ x 8.5	9 x 20	4 x 3 x 8.5	20	18	20	80 x 18	18
612	72 x 24	5 x 4 x 18.1	4 x 4 x 11.3	4 x 3 x 9.8	17	8 S. K. 69½	3½ x 3½ x 8.5	5 x 3 x 9.8	6 x 3½ x 11.7	3½ x 3½ x 8.5	9 x 20	4 x 3 x 8.5	22½	20	22½	90 x 20	20
636	72 x 24	5 x 4 x 18.1	4 x 4 x 11.3	4 x 3 x 9.8	17	8 S. K. 72	3½ x 3½ x 8.5	5 x 3 x 9.8	6 x 3½ x 11.7	3½ x 3½ x 8.5	9 x 25	5 x 3 x 9.8	22½	20	22½	90 x 20	20
660	72 x 25	6 x 4 x 20	5 x 4 x 16.2	4 x 3 x 11.1	18	8 S. K. 72	3½ x 3½ x 8.5	5 x 3½ x 10.2	6 x 3½ x 11.7	3½ x 3½ x 9.8	9 x 25	5 x 3 x 9.8	25	22½	25	90 x 22½	22½
684	72 x 25	6 x 4 x 20	5 x 4 x 16.2	4 x 3 x 11.1	18	10 S. K. 65	3½ x 3½ x 8.5	5 x 3½ x 10.2	6 x 3½ x 11.7	3½ x 3½ x 9.8	9 x 25	5 x 3 x 9.8	25	22½	25	90 x 22½	22½
708	78 x 25	6 x 4 x 20	5 x 4 x 16.2	4 x 3 x 11.1	18	10 S. K. 65	3½ x 3½ x 8.5	5 x 3½ x 10.2	6 x 3½ x 11.7	3½ x 3½ x 9.8	9 x 25	5 x 3 x 9.8	25	22½	25	90 x 22½	22½

*The outside or bilge girder keelsons should be fitted in line with the side tank plating and connected to tank top plating with angles given in the ninth column for vertical stiffeners.
†Plates of the weight of side keelsons must be fitted intercostal between floors to all side girder keelsons, flanged to shell and lugged to keelson plates with angles given in column 10.

TABLE G 3.

Stringers and Their Connecting Angles in Connection with Spardeck Arched Girders, With or Without Side Tanks, and Body Frames Spaced 36 Inches.

Length of Vessel between Stem and Stern Post	Depth of Hold	Depths to Length	SPAR DECK STRINGERS. Where the Width of Hatches Exceed One-Third the Beam. Section 85*							MAIN DECK STRINGERS. With Connecting Angles and Channel Bars. Section 86*						Top Side and Hold Stringers of Intercostal Plate and Channel Bar Section 87	
			Width and Thickness of the Outer Stringer for 3-4 Length	Width and Thickness at the Ends	Width and Thickness of the Inboard Stringer for 3-4 Length	Width and Thickness at the Ends	Seam Strap Connecting Stringer Plates	Hatch and Intermed't Intercostal and Continuous Channel Bar Stringer	Spar Deck Stringer Angle Bar	Dimension of Stringer for 3-4 Length to Machinery Space	Width and Thickness at the Ends	Channel on Inner Edge Stringer when Side Tanks are not Fitted	Angle Bar Connecting Stringer to Shell Plating and Face of Frame	Angle Bar on Inner Edge of Stringer when Side Tanks are Fitted	Bracket Plate Full Width of String'r at each Body Frame	Plates Int. Betw'n Frames	Cont's Channel Connecting Intercostal Plates
Col. 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16		18
Feet	ft.	ft.	ins. lbs	ins. lbs.	ins. lbs.	ins. lbs.	ins. lbs.	lbs.	ins. lbs.	ins. lbs.	ins. lbs.	ins. lbs.	ins. lbs.	ins. lbs.	lbs.		
																Three Stringers	
392	27	14½	60 x 38	40 x 24	44 x 31	29 x 22	18 x 38	Each	6 x 6 x 25.6	50 x 23	28 x 17	10 x 20	3½ x 3½ x 8.5	5 x 5 x 16.2	15	15	12 x 25
	28	to	60 x 37	40 x 23	44 x 30	29 x 21	18 x 37	45 & 45	6 x 6 x 25.6	50 x 22	28 x 16	10 x 20	3½ x 3½ x 8.5	5 x 5 x 16.2	15	15	12 x 25
	29	13½	60 x 36	40 x 22	44 x 29	29 x 20	18 x 36	45 & 45	6 x 6 x 25.6	50 x 21	28 x 15	10 x 20	3½ x 3½ x 8.5	5 x 5 x 16.2	15	15	12 x 25
404	27	15	60 x 38	40 x 24	44 x 31	29 x 22	24 x 38	45 & 45	6 x 6 x 25.6	50 x 23	28 x 17	12 x 25	3½ x 3½ x 8.5	5 x 5 x 16.2	15	15	12 x 25
	28	to	60 x 37	40 x 23	44 x 30	29 x 21	24 x 37	45 & 45	6 x 6 x 25.6	50 x 22	28 x 16	12 x 25	3½ x 3½ x 8.5	5 x 5 x 16.2	15	15	12 x 25
	29	14	60 x 36	40 x 22	44 x 29	29 x 20	24 x 36	45 & 45	6 x 6 x 25.6	50 x 21	28 x 15	12 x 25	3½ x 3½ x 8.5	5 x 5 x 16.2	15	15	12 x 25
416	28	15	60 x 38	40 x 24	44 x 36	31 x 22	24 x 38	50 & 50	6 x 6 x 25.6	50 x 23	28 x 17	12 x 25	3½ x 3½ x 8.5	5 x 5 x 16.2	15	15	12 x 25
	29	to	60 x 37	40 x 23	44 x 35	31 x 21	24 x 37	50 & 50	6 x 6 x 25.6	50 x 22	28 x 16	12 x 25	3½ x 3½ x 8.5	5 x 5 x 16.2	15	15	12 x 25
	30	14	60 x 36	40 x 22	44 x 34	31 x 20	24 x 36	50 & 50	6 x 6 x 25.6	50 x 21	28 x 15	12 x 25	3½ x 3½ x 8.5	5 x 5 x 16.2	15	15	12 x 25
428	28	15	60 x 38	40 x 24	46 x 38	31 x 23	24 x 38	50 & 50	6 x 6 x 28.7	52 x 23	30 x 17	12 x 25	3½ x 3½ x 8.5	5 x 5 x 16.2	15	15	12 x 25
	29	to	60 x 37	40 x 23	46 x 37	31 x 22	24 x 37	50 & 50	6 x 6 x 28.7	52 x 22	30 x 16	12 x 25	3½ x 3½ x 8.5	5 x 5 x 16.2	15	15	12 x 25
	30	14	60 x 36	40 x 22	46 x 36	31 x 21	24 x 36	50 & 50	6 x 6 x 28.7	52 x 21	30 x 15	12 x 25	3½ x 3½ x 8.5	5 x 5 x 16.2	15	15	12 x 25
440	28	15¾	60 x 38	40 x 24	46 x 38	31 x 23	24 x 38	50 & 50	6 x 6 x 28.7	52 x 23	30 x 17	12 x 25	3½ x 3½ x 8.5	5 x 5 x 16.2	15	15	12 x 30
	29	to	60 x 37	40 x 23	46 x 37	31 x 22	24 x 36	50 & 50	6 x 6 x 28.7	52 x 22	30 x 16	12 x 25	3½ x 3½ x 8.5	5 x 5 x 16.2	15	15	12 x 30
	30	14¾	60 x 36	40 x 22	47 x 36	31 x 21	24 x 36	50 & 50	6 x 6 x 28.7	52 x 21	30 x 15	12 x 25	3½ x 3½ x 8.5	5 x 5 x 16.2	15	15	12 x 30
452	28	16	60 x 38	40 x 24	46 x 38	31 x 23	24 x 38	50 & 50	6 x 6 x 28.7	54 x 24	32 x 17	12 x 25	3½ x 3½ x 8.5	5 x 5 x 16.2	15	15	12 x 30
	29	to	60 x 37	40 x 23	46 x 37	31 x 22	24 x 37	50 & 50	6 x 6 x 28.7	54 x 23	32 x 16	12 x 25	3½ x 3½ x 8.5	5 x 5 x 16.2	15	15	12 x 30
	30	15	60 x 36	40 x 22	46 x 36	31 x 21	24 x 36	50 & 50	6 x 6 x 28.7	54 x 22	32 x 15	12 x 25	3½ x 3½ x 8.5	5 x 5 x 16.2	15	15	12 x 30
464	29	16	60 x 38	40 x 24	46 x 38	31 x 23	24 x 38	50 & 50	6 x 6 x 28.7	54 x 24	32 x 17	12 x 25	3½ x 3½ x 8.5	5 x 5 x 16.2	15	15	12 x 30
	30	to	60 x 37	40 x 23	46 x 37	31 x 22	24 x 37	50 & 50	6 x 6 x 28.7	54 x 23	32 x 16	12 x 25	3½ x 3½ x 8.5	5 x 5 x 16.2	15	15	12 x 30
	31	15	60 x 36	40 x 22	46 x 36	31 x 21	24 x 36	50 & 50	6 x 6 x 28.7	54 x 22	32 x 15	12 x 25	3½ x 3½ x 8.5	5 x 5 x 16.2	15	15	12 x 30
476	29	16½	60 x 38	40 x 24	48 x 40	33 x 24	30 x 40	50 & 50	6 x 6 x 28.7	56 x 24	34 x 17	12 x 25	3½ x 3½ x 8.5	5 x 5 x 16.2	15	15	15 x 33
	30	to	60 x 37	40 x 23	48 x 40	33 x 24	30 x 40	50 & 50	6 x 6 x 28.7	56 x 23	34 x 16	12 x 25	3½ x 3½ x 8.5	5 x 5 x 16.2	15	15	15 x 33
	31	15	60 x 36	40 x 22	48 x 40	33 x 24	30 x 40	50 & 50	6 x 6 x 28.7	56 x 22	34 x 15	12 x 25	3½ x 3½ x 8.5	5 x 5 x 16.2	15	15	15 x 33

*The midship width and thickness, of the spar and main deck stringers, to be maintained for three-fourths the vessel's length and extend to the after end of the machinery space when the machinery is placed in the stern of the vessel.

Note—Intermediate hold stringers, forward and aft, must be fitted when unsupported shell plating between frames exceed 16 ft. For particulars of spar deck hatch and intermediate supporting stringers in column 9, see section 85.

TABL

Center, and Side Girder Keelsons, and Their Connecting Angles, in Connection
and Stanchions a

	CENTER VERTICAL KEELSON PLATING AND CONNECTING ANGLES.				SIDE KEELSONS AND TH			
Length of Vessel Between Perp's	Weight and Depth of Center Keelson	Longitudinal Double Angles Connecting Keel & Keelson Plating	Longitudinal Double Angles Connecting Keelson & Tank-top Plating	Vertical Angles Connecting Floors and Center Keelson Plating	Weight of side Keelsons and their Intercost'l Plating	Spacing and Number of Side Keelson	Longitudinal Angles Connecting Side Keelsons with Floors and Tank-top	A
Feet	ins. lbs.	ins. lbs.	ins. lbs.	ins. lbs.	lbs.	No. Ins.	ins. lbs.	
1	2	3	4	5	6	7	8	
180	48 x 15	4 x 3 x 9.8	3 x 3 x 7.2	3 x 3 x 6.1	11	6 S. K. 48	3 x 3 x 6.1	
204	48 x 15	4 x 3 x 9.8	3 x 3 x 7.2	3 x 3 x 6.1	11	6 S. K. 48	3 x 3 x 6.1	
228	48 x 15	4 x 3 x 9.8	3 x 3 x 7.2	3 x 3 x 6.1	11	6 S. K. 48	3 x 3 x 6.1	
252	48 x 17½	4 x 3 x 10.1	3½ x 3 x 7.8	3 x 3 x 7.2	13	6 S. K. 50	3 x 3 x 6.6	
276	48 x 17½	4 x 3 x 10.1	3½ x 3 x 7.8	3 x 3 x 7.2	13	6 S. K. 50	3 x 3 x 6.6	
300	48 x 17½	5 x 4 x 12.8	3½ x 3 x 7.8	3 x 3 x 7.2	13	6 S. K. 56	3 x 3 x 7.2	
324	48 x 17½	5 x 4 x 12.8	4 x 3 x 8.5	3 x 3 x 7.2	13	6 S. K. 56	3 x 3 x 7.2	
348	54 x 19	5 x 4 x 12.8	4 x 3 x 8.5	3 x 3 x 7.2	15	6 S. K. 66	3 x 3 x 7.2	
372	54 x 19	5 x 4 x 12.8	4 x 3 x 8.5	3 x 3 x 7.2	15	6 S. K. 66	3 x 3 x 7.2	
396	54 x 19	5 x 4 x 14.5	4 x 3 x 8.5	3 x 3 x 7.2	15	6 S. K. 66	3 x 3 x 7.2	
420	60 x 20	5 x 4 x 14.5	4 x 4 x 9.8	3½ x 3½ x 8.5	16	8 S. K. 62	3 x 3 x 7.2	
444	60 x 20	5 x 4 x 14.5	4 x 4 x 9.8	3½ x 3½ x 8.5	16	8 S. K. 62	3 x 3 x 7.2	
468	60 x 20	5 x 4 x 14.5	4 x 4 x 9.8	3½ x 3½ x 8.5	16	8 S. K. 62	3 x 3 x 7.2	
492	60 x 22½	5 x 3½ x 15.2	4 x 4 x 9.8	3½ x 3½ x 8.5	16	8 S. K. 67	3 x 3 x 7.2	
516	60 x 22½	5 x 3½ x 15.2	4 x 4 x 9.8	3½ x 3½ x 8.5	16	8 S. K. 67	3 x 3 x 7.2	
540	60 x 22½	5 x 3½ x 15.2	4 x 4 x 9.8	4 x 3 x 9.8	16	8 S. K. 67	3 x 3 x 7.2	
564	60 x 22½	5 x 3½ x 15.2	4 x 4 x 11.3	4 x 3 x 9.8	16	8 S. K. 69½	3 x 3 x 7.2	
588	60 x 22½	5 x 4 x 16.2	4 x 4 x 11.3	4 x 3 x 9.8	17	8 S. K. 69½	3 x 3 x 7.2	
612	72 x 24	5 x 4 x 18.1	4 x 4 x 11.3	4 x 3 x 9.8	17	8 S. K. 69½	3½ x 3½ x 8.5	
636	72 x 24	5 x 4 x 18.1	4 x 4 x 11.3	4 x 3 x 9.8	17	8 S. K. 72	3½ x 3½ x 8.5	
660	72 x 25	6 x 4 x 20	5 x 4 x 16.2	4 x 3 x 11.1	18	8 S. K. 72	3½ x 3½ x 8.5	
684	72 x 25	6 x 4 x 20	5 x 4 x 16.2	4 x 3 x 11.1	18	10 S. K. 65	3½ x 3½ x 8.5	
708	78 x 25	6 x 4 x 20	5 x 4 x 16.2	4 x 3 x 11.1	18	10 S. K. 65	3½ x 3½ x 8.5	

*The outside or bilge girder keelsons should be fitted in line with the side tank plating and connected to
†Plates of the weight of side keelsons must be fitted intercostal between floors to all side girder keelsons,

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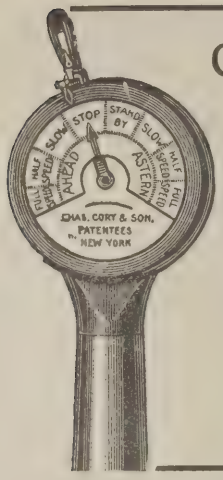

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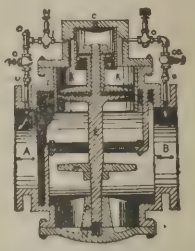

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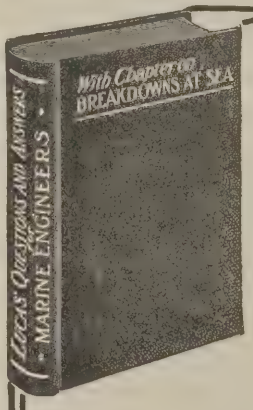

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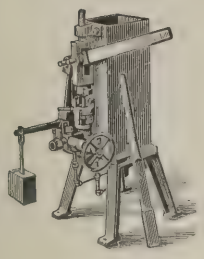

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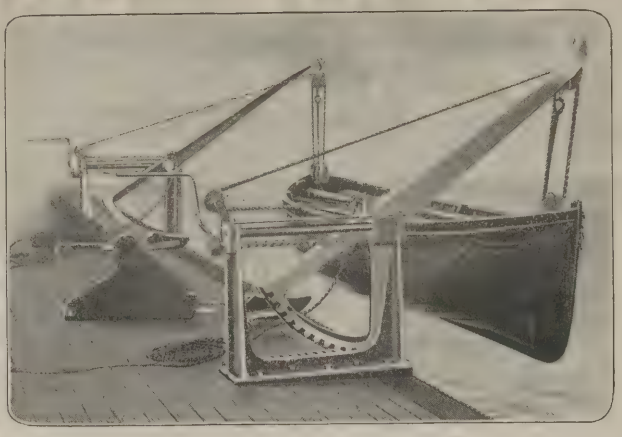

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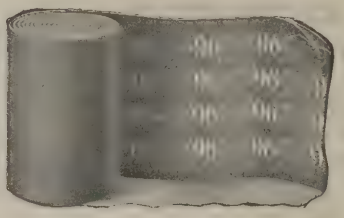

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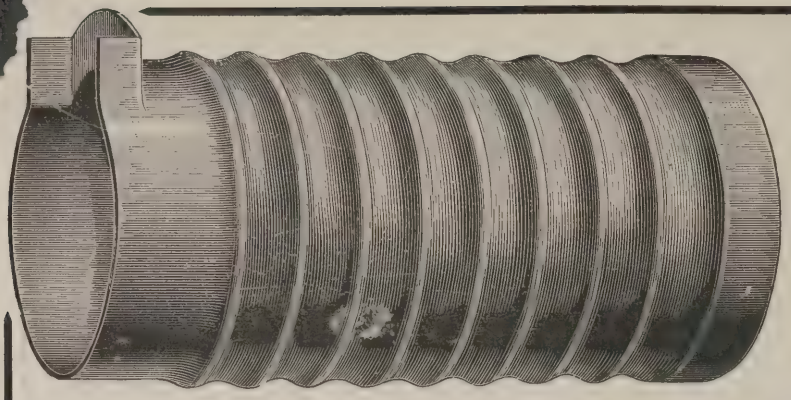

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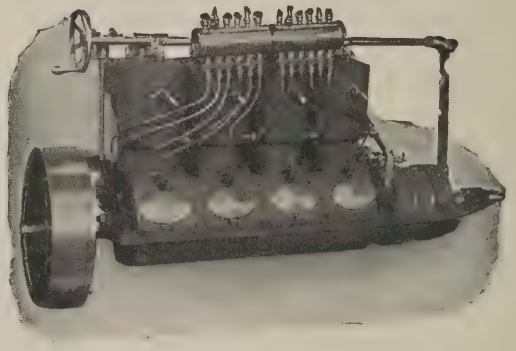

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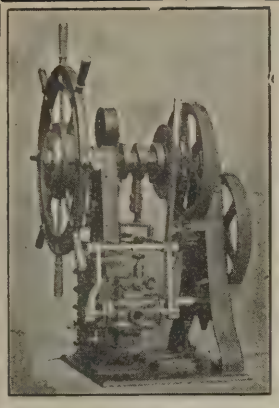

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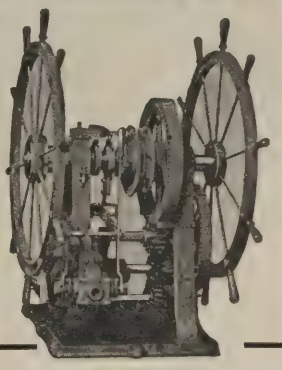

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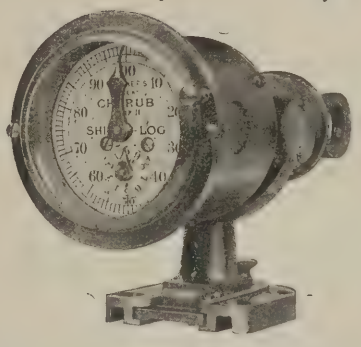

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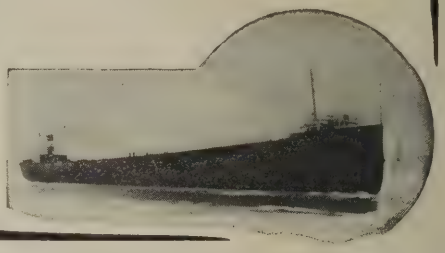

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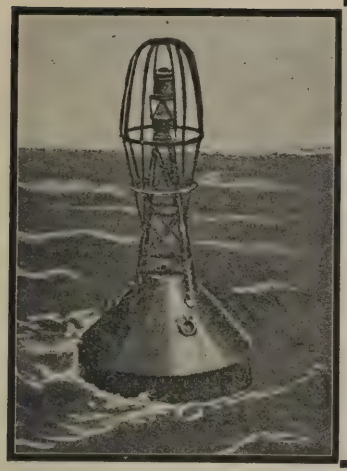

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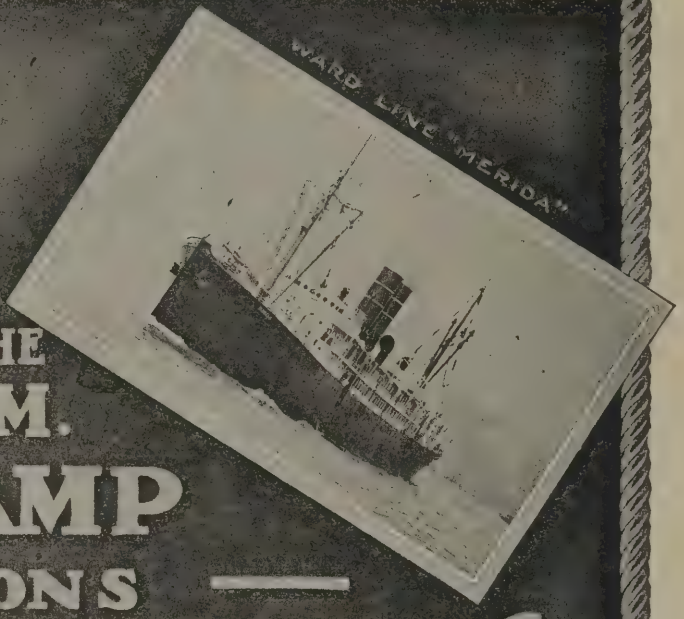

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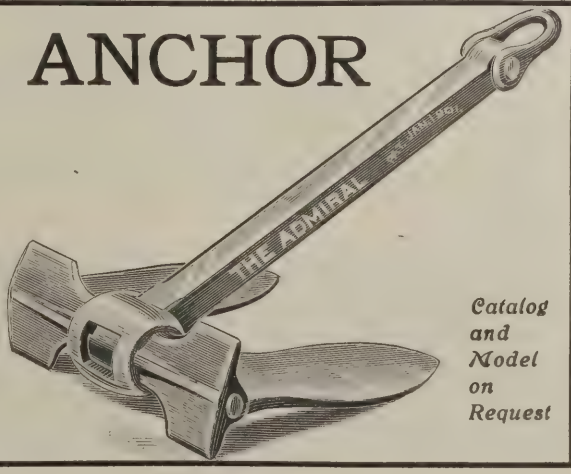

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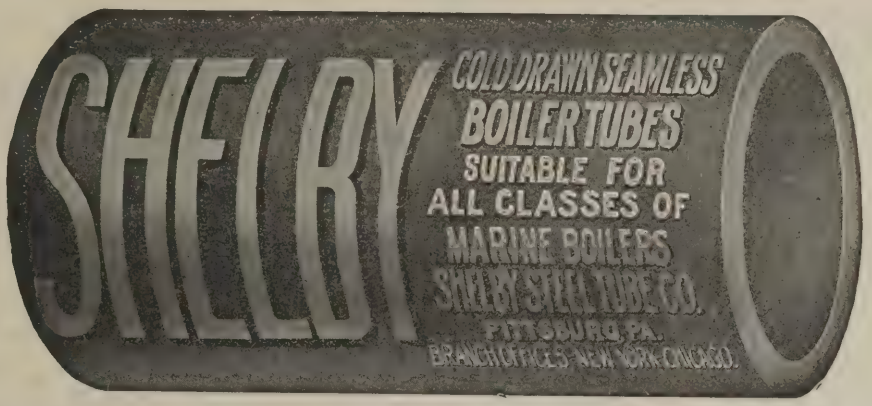

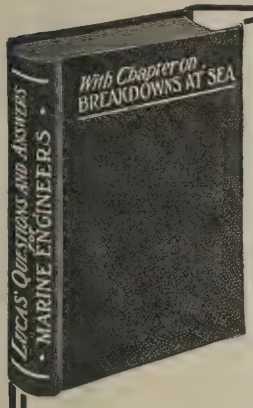

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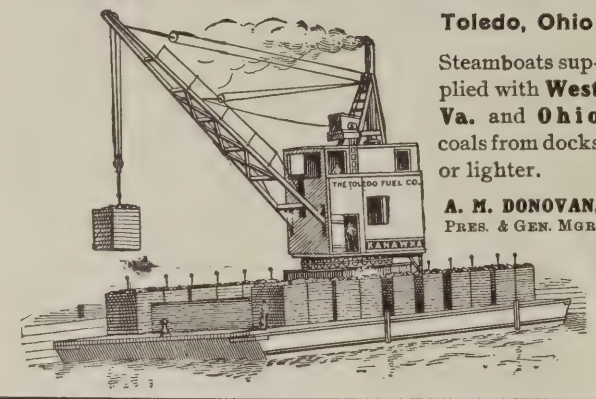

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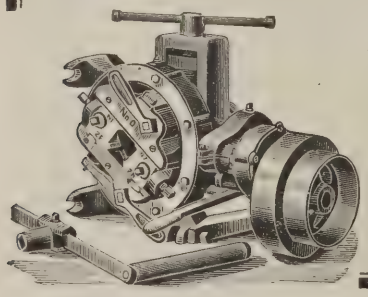

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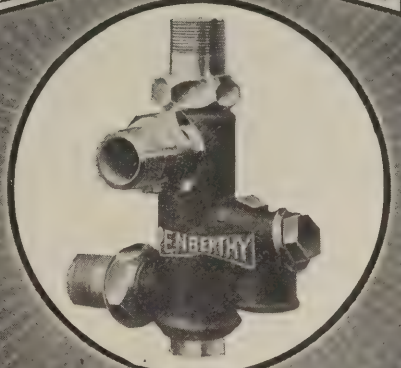

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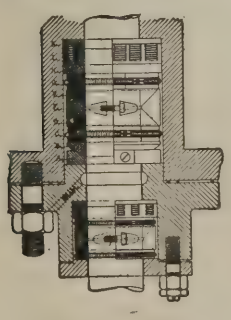

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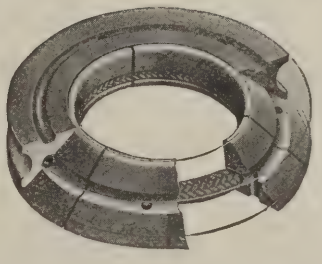

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THE MARINE REVIEW

VOL. 36. CLEVELAND, NOVEMBER 21, 1907. NEW YORK No. 21

THE GROWTH OF BRITISH SHIPPING.

The board of trade has just issued a series of tables showing the progress of merchant shipping in the United Kingdom and the principal maritime countries. The first of these shows the tonnage of sailing and steam vessels of different nationalties entered and cleared in the foreign trade at the ports of this country for a series of years; and the figures demonstrate (1) the enormous growth of British trade, (2) a slight but gradual increase in the competition of foreign shipping, and (3) the practical disappearance of the sailing ship.

Beginning with the year 1860 the total tonnage, sailing and steam, with cargoes and in ballast, entered and cleared was 24,689,292. Ten years later this total had been increased by 12,000,000 tons, but in the seventies the growth was in much greater proportion, and in 1880 the figures stood at 58,736.063 tons. In 1890 it had increased by fifteen and a half million tons, and in 1900 by a further 24¼ million tons; while last year it reached the enormous total of 120,790,310 tons. British ships have always carried the greater part of this trade, but the percentage has varied at different times. In 1860 the British tonnage was 56.4 per cent of the total, in 1870 68.4, in 1880 70.4, and in 1890 72.7. High-water mark was reached in 1895, when the proportion was 72.9 per cent. In 1900 it fell to 63.7, but in 1901 it rose to 64.4, in 1902 to 64.9, and in 1903 to 65.5. It fell again in 1904 to 64.2, and in the two succeeding years it stood at 63.3 per cent. If we take steam tonnage alone, the percentage is slightly higher, but, on the other hand, it has fallen at a more rapid rate. For example, in 1870, when only about 40 per cent of the tonnage entered and cleared was steam, 88½ per ecnt, of that steam tonnage was British. In 1880 the proportion fell to 83.2 per cent, in 1890 to 79.5, in 1900 to 66.8, and in 1906 to 65.1. This reduction is due mainly to the abnormal growth in the shipping of Germany, Norway, Holland, and Denmark. British tonnage entered and cleared at British ports has grown steadily. In 1860 it was 13,914,923, of which 4,186,620 was steam; and in 1906 it was 76,465,979, of which 75,347,224 was steam. In 1860 the foreign tonnage entering and clearing at British ports was 10,774,369, of which 780,853 tons was steam; and in 1906 it was 44,324,331, of which 40,374,078 was steam.

In 1860 nearly 80 per cent of the total tonnage and 70 per cent of the British tonnage entered and cleared was represented by sailing ships. In 1870 the steam tonnage had grown to 41 per cent of the total, and 53 per cent of the British tonnage; in 1880 to 63 per cent of the total, and 75 per cent of the British; in 1890 to 83 per cent of the total, and 90 per cent of the British; and in 1900 to 91 per cent of the total, and 96 per cent of the British. Last year the ships entered and cleared at British ports represented 120,790,310 tons, of which 115,721,302 was steam tonnage, and of 76,465,979 tons of British shipping entered and cleared only 1,118,755 tons represented sailing ships. Forty-six years ago sailing ships represented a tonnage of 20,000,000, or four-fifths of the total entrances and clearances; today they represent a tonnage of 5,000,000, or 1/24 of the total. British sailing ships in 1860 represented a tonnage entered and cleared of 9,750,000 out of a total of 14,000,000 tons; today they represent but 1½ per cent of the total. The tables show a four-fold growth in the tonnage of foreign vessels entered and cleared in ports of the United Kingdom. German tonnage has increased from 2,314,255 in 1860 and 1,763,433 in 1870 to over 9,000,000 in 1906; Norwegian from 1,456,764 in 1860 to 7,504,637; Danish from 750,000 to 4,700,000; Dutch from 500,000 to 4,000,000, and Russian from 250,000 to 5,000,000 tons. On the other hand, American tonnage in 1860 was 2,981,697, and was entirely in sailing ships. In the succeeding 30 years this shipping trade almost entirely disappeared. and in 1890 the American tonnage entered and cleared was only 291,933. Since then the entrances and clearances of American steam tonnage has grown steadily, until last year it reached 1,240,177.

The tonnage of the merchant navies of different countries is given as follows:

United Kingdom	11,167,332
British Possessions	1,624,049
Russia	1,083,000
Norway	1,392,593
Sweden	744,307
Denmark	517,201
Germany	2,515,815
Holland	462,465
France	1,214,505
Spain	722,517
Italy	922,182
United States (for oversea trade)	939,486
Japan	1,394,745

The North German Lloyd liner Kaiser Wilhelm der Grosse, which lost her rudder off the Newfoundland banks last month, has been found to be more seriously damaged than was at first believed, and she will be taken out of the service for a period of five months, during which she will undergo repairs.

SUMMARY OF NAVAL CONSTRUCTION.

The summary of naval construction issued by the navy department shows the customary rate of progress upon naval vessels as follows:

NAME OF VESSEL.	BUILDING AT—	—1907— —Per cent of completion.— Oct. 1.	Nov. 1.
BATTLESHIPS.			
Mississippi	Wm. Cramp & Sons	94.96	96.82
Idaho	Wm. Cramp & Sons	87.54	89.41
New Hampshire	New York S. B. Co	85.30	90.20
South Carolina	Wm. Cramp & Sons	24.66	28.83
Michigan	New York S. B. Co	25.70	29.10
Delaware	Newport News S. B. Co	00.65	2.33
North Dakota	Fore River S. B. Co	00.00	4.23
ARMORED CRUISERS.			
North Carolina	Newport News S. B. Co	91.50	93.33
Montana	Newport News S. B. Co	84.62	87.38
SCOUT CRUISERS.			
Chester	Bath Iron Works	90.64	92.70
Birmingham	Fore River S. B. Co	89.46	90.79
Salem	Fore River S. B. Co	86.99	88.52
TORPEDO BOAT DESTROYERS.			
T. B. Destroyer No. 17	Wm. Cramp & Sons	00.00	00.00
T. B. Destroyer No. 18	Wm. Cramp & Sons	00.00	00.00
T. B. Destroyer No. 19	New York S. B. Co	00.00	00.00
T. B. Destroyer No. 20	Bath Iron Works	00.00	00.00
T. B. Destroyer No. 21	Bath Iron Works	00.00	00.00
SUBMARINE TORPEDO BOATS.			
Submarine T. B. No. 9	Fore River S. B. Co	99.00	99.00
Submarine T. B. No. 10	Fore River S. B. Co	99.00	*
Submarine T. B. No. 11	Fore River S. B. Co	99.00	*
Submarine T. B. No. 12	Fore River S. B. Co	99.00	99.00
COLLIERS.			
Vestal	Navy Yard, New York	49.00	52.70
Prometheus	Navy Yard, Mare Island	00.70	6.60
TUG BOATS.			
Patapsco	Navy Yard, Portsmouth	28.00	28.00
Patuxent	Navy Yard, Norfolk	25.00	27.00

*Delivered at Naval Torpedo Station, Newport, R. I., Oct. 16, 1907.

PLANS FOR NAVAL REVIEW.

That the review by President Roosevelt of the 16 battleships of the Atlantic fleet, which is to take place prior to their sailing for the Pacific, will be the greatest ever witnessed in American waters is the opinion of naval officers, and great enthusiasm is being displayed among both the officers and men of the vessels partaking over the preparations for the great pageant.

The fleet that passed in review before President Roosevelt on Sept. 3, 1906, at Oyster Bay numbered more vessels than will be reviewed on Dec. 16, but it was a vastly inferior fleet in displacement and armament compared to the magnificent line of modern vessels which the public will have a chance to see assembled in Atlantic waters for the last time in several years, perhaps, a few weeks hence. In the fleet of 1906 there were 12 battleships in line, and of this dozen two were vessels that since have been put in reserve—that is, practically retired from the fighting line. These ships were the Indiana and Iowa.

In the review next month, the ships that will be present and which were not seen in Oyster Bay in September, 1906, are the Connecticut, Georgia, Kansas, Vermont, Ohio, and the Minnesota. In addition to the battleships, there also will be in the review every one of the auxiliaries that will accompany Admiral Evans to the Pacific.

As figured out by one of the officers of the flagship Connecticut, the following in all probability, will be the order in which the ships will pass in review on Dec. 16:

FIRST SQUADRON.
First Division.
Connecticut, flagship of Rear Admiral Robley D. Evans, Commander-in-Chief of the Atlantic Fleet.
Louisiana.
Kansas.
Vermont.

Second Division.
Rear Admiral William H. Emory, commanding. Georgia, flagship of Rear Admiral Emory.
Virginia.
New Jersey.
Rhode Island.

SECOND SQUADRON.
Third Division.
Rear Admiral Charles M. Thomas, commanding. Minnesota, flagship of Rear Admiral Thomas.
Ohio.
Maine.
Missouri.

Fourth Division.
Rear Admiral C. S. Sperry, commanding. Alabama, flagship of Rear Admiral Sperry.
Illinois.
Kearsarge.
Kentucky.

Fleet Auxiliaries.
Celtic, supply ship.
Culgoa, supply ship.
Panther, repair ship.
Arethusa, tender.
Yankton, tender.
Hannibal, collier.
Leonidas, collier.
Marcellus, collier.
Brutus, collier.
Ajax, collier.
Abarenda, collier.
Caesar, collier.
Nero, collier.

President Roosevelt, of course, will review the fleet from the bridge of the naval yacht Mayflower. Immediately preceding or following the review, the president; it is understood, will visit in turn each of the four flagships of the fleet. On the bridge of the Mayflower with the president probably will be the secretary and assistant secretary of the navy, Admiral Dewey, the president of the general board; Rear Admiral Brownson, the chief of the bureau of navigation, and probably several of the flag officers who are at the head of bureaus in the navy department at Washington.

NAVIGATION AND NAUTICAL LECTURES.

During the academic year 1907-08 Columbia University, New York, in co-operation with officers of the United States navy and the United States coast and geodetic survey, offers a series of public lectures in navigation and nautical science. They are intended for yachtsmen, officers of merchant vessels in New York harbor, and all persons interested in the safe navigation of the seas. The lectures will be given in 309 Havemeyer on Tuesday afternoons at 4:30 on the dates following, and will be illustrated:

Nov. 12, introductory address, Rear Admiral C. F. Goodrich, U. S. N.; "Dead Reckoning and Coastwise Navigation," Lieut. Com. W. S. Crosley, U. S. N.; Nov. 19, "The Bottom of the Sea and Its Uses in Navigation: Latitude," Lieut. Com. R. H. Leigh, U. S. N.

Dec. 3, "Deep Sea Navigation: Longitude," Lieut. Com. R. H. Leigh, U. S. N.; Dec. 10, "The Sun and Its Motions," Prof. Poor; Dec. 17, "The Making of an Almanac," Prof. Poor.

Jan. 14, "Tides: Their Characteristics, Observation and Prediction," Dr. R. A. Harris; Jan. 21, "The Causes and Representation of the Tides," Dr. R. A. Harris; Jan. 28, "Tidal Currents and Meteorological Tides," Dr. R. A. Harris.

Feb. 14, "How Charts Are Made and Used," lecturer to be announced; Feb. 11, "The Magnetic Survey of the Pacific Ocean by the Carnegie Institution," Dr. L. A. Bauer; Feb. 18, "Finding the North Magnetic Pole," Prof. Hallock; Feb. 25, "The History

of the Compass and Its Errors," Capt. Howard Patterson.

The lectures are open to the public. No tickets of admission are required, but the doors will be closed promptly at 4:30 p. m. Syllabi will be prepared and may be had upon application to the secretary of the university.

IN THE MATRIX.

BY JAMES ROSSAN.

The engineer of the Magnolia walked through the machine shop surveying the busy scene. As his glance wandered over the various workmen at their machines or benches there lurked something in it akin to contempt. Presently he encountered the foreman, and in his blunt, abrupt way he threw his wants at him.

"I want an oiler."

"Yes, sir, Mr. Currie," the foreman answered in his smooth way, acquired through years of efforts to please customers. "I think we have just the fellow who will suit you, only the other day he spoke of wanting an opportunity to go to sea."

"Same old story, I suppose," Currie interrupted, "looking for a chance to see the country at good wages with nothing to do?"

"No, Mr. Currie, I hardly think that is the case this time," the foreman replied meekly, bearing in mind sundry experiences of the past.

"Has he served his time?" was the engineer's next query.

"Yes, sir, and two years as a journeyman besides."

"And that makes it all the worse," Currie kept on in his skeptical way.

"How is that?"

"Too much to unlearn. But, never mind, I'll give him a show and if it is in him it will just naturally work out itself."

The man in question was a clean-cut young fellow who had come into the shop early in life to serve his apprenticeship. He had shown an aptness for the work. He was precise in his calculations, and became a rapid and skillful workman. So he naturally drifted into the more responsible jobs of the shop. It was he who was sent aboard of the boats to replace a broken crankpin, or, perhaps, to line up an old scrapheap with a hankering to run on an inclined plane. It was he who was sent to the dry dock to key on propellers or take out bent tailshafts. And thus he came to be counted a first class machinist.

Now there comes a time in the life of most young men when they feel the call of the sea. The free, roving, adventurous life draws like a magnet, and Finlay Moran was no exception to the rule. Of course, the engine room was his natural bent.

The United States government is very particular about the men employed as marine engineers, and makes very sure that they have the proper amount of practical experience gained only in the engine rooms of the boats. Had it not been for this fact he would probably have considered himself a full-fledged engineer, as he told Currie he had a fair knowledge of thermodynamics and also of the practical running of machinery ashore. Yet the route of the oiler was the only way open to fame. So he was regularly shipped on the Magnolia, and Currie was the man who was to take him through his paces.

There was an air of importance about him as he stepped aboard the ship and surveyed the big engines of which he was to become the mentor. The responsibility lay heavy on him, and he figured that his vast knowledge of mechanics would stand him in good stead now, as well as the many handsome tools he brought, such as calipers, micrometers, protractors and many others used in fancy calculations.

The Magnolia was one of the old-style wooden boats, but her machinery was comparatively modern and powerful; in fact, that was the Magnolia's trouble, too much for the old weakened hull.

The skipper was an ambitious man, in loading the boat he had overstepped the limit. Consequently she had not proceeded far on her voyage before she stuck on a mudbank in the draw of a bridge. This blocked navigation and there was the dickens to pay. The services of a couple of tugs were enlisted, but to no avail.

Currie was an ambitious man too, he overstepped the limit in the amount of power produced, and very promptly the horsepower crankpin brasses went up in smoke. Although things were blue in the engine room, the new oiler almost exulted in the occurrence. This was in his line, there would be repair work now, and he would show them what he was good for.

The connection was hurriedly taken down, and it was found that the brasses had sprung and clamped solid on the pin; this made it evident that they would have to be cleared out. Finlay had already made a mental calculation of how he would do the job. He had repaired many like it, and would fall into the work perfectly natural. He would smooth the pin, first with a fine file and later with a whetstone, then he would take the brasses to the shop and bore them a trifle larger than the pin, thus giving them the proper amount of clearance.

Hardly had he finished his calculation on the proper size to bore them when the skipper came to the engine room and announced in tones not to be mistaken that he wanted those engines, and wanted them p. d. q. And Currie answered him, that they would be at his services in 30 minutes.

The oiler nearly threw an apoplectic fit upon hearing this. Of course, all idea of the shop was knocked into a cocked hat, and he asked wonderingly:

"Shall I start scraping them, sir?"

"Scrape your grandmother!" was the answer.

"Ah, I see," he continued, somewhat taken aback. "You intend to file them, that is quicker but it leaves them pretty rough."

"File hell!" came the blunt answer again. "Get a hammer and cold chisel and chip it off in a hurry." The obnoxious metal was cut away, and, to the consternation of the oiler, only the rough edges were smoothed over with the file. The connection was then hastily assembled and inside of thirty minutes the engines were churning away full speed ahead. In due time the ship wiggled over the mudbank and slid out into the deep, clear water beyond. And the new oiler had learned lesson number one.

It did not take Currie long to break the new man in to caring for the machinery, and out in the lake all things ran smoothly. Then, one morning, the "second" came to the engine room. He was another blunt, abrupt son of Vulcan. He faced the oiler and said:

"Say, who do you suppose is going to keep this boat clean? The ceiling is smoky, the walls are spotted and the floors are greasy. Now I'll show you how to do it, and then you get busy!"

He was now shown how to utilize the few spare minutes, when the engines did not require his attention, in cleaning up. Perhaps it was a quick dash over a section of the wall with a scrubbing brush and sponge, perhaps it was a rub with pomade and whitening on a soiled piece of brass; the idea was to do it quick and thorough. That "second" was an expert at it, he had been through the mill himself. This quite dispelled any illusion the oiler had nourished about steamboating being a soft snap. Men-

tally he began drawing comparisons of standing at the lathe clad in a neat suit of overalls and a frantic chasing around among flying machinery in a grease-covered suit, with an occasional dive into the bilges or a spasmodic scrubbing-bee for variation. Yet, in spite of it all, he liked the work. There was the satisfaction of viewing the finished product as represented by the speed of the boat. And I am happy to say that in time he assimilated lesson number two; and no boat arrived in port with engine room cleaner and slicker than the Magnolia.

It happened a few trips later that they had a couple of days at the dock. The work had been piling up and now was the opportunity to catch up. All day they worked at the various jobs. Unlike in the shop evening brought no respite. Along toward morning it required considerable of an effort on Finlay's part to keep awake. In a dexterous way he managed to convey the idea to the "chief" that a little sleep would be welcome.

"Sleep!" that dignitary broke him off with. "Did you come aboard of this boat to work or to sleep? Now remember, we work when there is work to do and sleep when there is none!"

The oiler conjured up a sad comparison between his snug bed at home and night work on a steamboat, but gradually the fact dawned on him that boats must be kept going at all hazard, and this was lesson number three.

He learned other lessons too numerous to mention. Then came the heat of summer and with it its attendant trouble in the stokehold. On this particular trip a couple of booze-fighters were shipped and ere the voyage was half completed distress signals in the shape of cramps were in evidence.

During the entire watch Currie had been busy repairing a broken windlass forward. Upon his arrival in the engine room he noticed the sooty marks of the stokehold on the oiler. His inquiry after the stoker brought the following answer:

"Yes, he's knocked out altogether, so I took her. The other fellow is gone, too, but I'll take her after dinner."

And he did take her after dinner. And he held her several watches after that without murmur or palaver. Currie was almost dumbfounded. It ran against the grain to see a man working like that, but previous experiences with getting men to man the stokehold in emergencies made him keep his peace.

At the end of the voyage he slapped the oiler good-naturedly on the back and said:

"What made you do it, my lad?"

"Well, you see," he answered, "I came on this boat to work. With both of them gone, I figured it was up to me."

"Was that all?" said Currie, looking him steadily in the eye.

"No, sir, not exactly," he admitted. "Of course, I was perfectly sure of the engine room, but I had my doubts about being able to handle them in the stokehold. Now I know. And, man, look at the experience I have had."

Currie never answered a word, but later in the day, as he walked into the shop and the foreman greeted him with the customary: "Well, how's the oiler?" he answered him in tones which portrayed the depth of his convictions:

"That boy's alright. You can bet your whiskers that he will be coming into port on them for a long time to come. Not as oiler though, but as chief engineer of them, and the best of them at that."

"Well, did'nt I tell you that he was a first class workman?" the foreman put in.

"Yes, but it is'nt exactly that," Currie replied.

"And also that he was a good, decent, clean-cut fellow," the foreman continued.

"And it's not just that, either," Currie persisted.

"Well, then, what in the world is it?"

"Mark my words," Currie answered, looking the foreman straight in the eye. "You could drop him from a balloon into a derelict and he would do something with her, start her for the harbor some way, even if he had to bale her out with his hat, steam her up with the bulwarks and drive her in with a deckwinch. You see, he has the qualification which goes to make up a marine engineer."

"And that is?" came in an awed whisper from the foreman.

"Adaptability."

The United States Transportation Co., generally known as the Neptune line, recently acquired control of the Joy Steamship Co. and has entered into the operation of its fleet. The latter company operated its steamships from New York to Boston and Providence.

TURBINE V. RECIPROCATING ENGINES IN ATLANTIC LINERS.

The German critic says that reciprocating engines, when worked at lower powers, have a "comparatively exceedingly high" reduction in coal consumption, giving high radius of action, and that such is not the case with the turbine steamers. It is true that experience has shown that at low powers turbines are not quite so economical as reciprocating engines; but it must not be forgotten that in the Atlantic service the periods of reduced speed are rare, and are even then of short duration. The practice rather is to drive the ship at full power, under which condition there is no reason why the turbine should not be as economical as reciprocating engines, if not more so. We cannot, however, understand why Dr. Wiegand should continue: "When the speed of a turbine is reduced, the coal consumption remains practically the same; its efficiency, however, sinks down to a minimum. Should a turbine steamer encounter head winds and heavy seas, it can easily happen that for a largely increased passage time she will not have sufficient coal on board, while the steamer driven by reciprocating engines can always help herself by an important reduction in her speed." This, if accepted, is certain to create an absolutely wrong impression. Experiments show that for a range of power from full down to quarter power, the volume of steam entering a turbine is nearly constant. Since, however, the torque varies more or less proportionately to the initial pressure, the weight of steam passed through the turbine diminishes as the power is reduced, and in actual marine practice the total consumption at quarter power is less than half that at full load. So that Dr. Wiegand's statement is far from representing the actual facts of the case. Again, Dr. Wiegand surely understands that the rate of coal consumption per unit of power per hour —which alone is affected by the comparative efficiency of the turbine and reciprocating engines at low powers— does not greatly affect the aggregate coal consumption per nautical mile run at low powers; consequently, the Lusitania at 20 knots may steam the same distance for an equal, or, at least, only a slightly greater, amount of coal than a ship with reciprocating engines proceeding at a corresponding reduction of her full speed. The deduction made by Dr. Wiegand therefore falls. He further contends that

the loss in traveling speed due to heavy weather may be greater in the case of turbine steamers. owing to the small dimensions of the propellers. This is one of the difficult problems in connection with turbine propulsion. Dr. Wiegand points out that experience shows that the maximum propelling power of screws lies somewhat near 80 revolutions, and that in the Lusitania it is impossible, without loss of power, to go below 180 revolutions. These are bold statements, especially in view of the extremely cautious words by scientists who have made the propeller problem one of close investigation. One of the illuminating remarks made by Dr. Wiegand is that the propeller problem does not form a decisive objection, for it would probably be removed by gradual improvement. If improvement is possible in this respect, surely advance may be made also in connection with coal-consumption question, even admitting that at reduced speed on the Atlantic the turbine machinery is not economical. We believe that, so far, there is no marked inclination at the present time on the part of the German shipping companies to make what they regard as a costly experiment in building a ship to compete with the Lusitania and Mauretania, but we should welcome an attempt on the part of such an experienced firm as the Vulcan Co. to construct a ship with reciprocating engines to maintain an average speed of 24½ or 25 knots on the Atlantic. —*Engineering.*

AROUND THE GREAT LAKES.

The steamer Wallula of the Gilchrist Transportation Co.'s fleet has gone into winter quarters at Milwaukee.

Andrew Blackman, a sailor on the schooner Belle, was drowned in the harbor at Grand Haven on Monday. He was 18 years old.

Capt. Peter C. Smith, a well known vesselman, is suffering from a paralytic stroke at his home in Bay City, and is not expected to recover.

The steamer D. R. Hanna, while loading coal at Huron last Thursday, backed into the dock and disabled her rudder. It was necessary to make repairs before the steamer left port.

The steamer Leland S. DeGraef, bound down with ore, ran hard aground at Bar Point last Thursday and had to lighter considerable of her cargo before she could be released.

The new steamer Thomas Barlum, building at the Wyandotte yard of the American Ship Building Co., was launched at noon on Thursday of this week, and was christened by Mrs. John J. Barlum.

Wm. J. Murphy, of Manitowoc, Thomas Heffron, of Ashtabula, and Christian Johnson, of Cleveland, have been elected delegates to the International Seamen's convention to be held at Chicago next month.

The steamer Ramapo of the Union Steamboat line, which lost her rudder and propeller in Lake Michigan last week, will be out of commission for the balance of the season. The loss is estimated at $2,500.

The steamers Lycoming and Schoolcraft and the barges Bourke, Sweetheart, Nester and Unadilla, went into winter quarters at Tonawanda on Monday, making sixteen vessels tied up at that point up to the present time.

The steamer Frank Peavey, which was driven ashore at Buffalo in the storm on Wednesday of last week, was released on Thursday, in spite of the continued heavy weather. She is not seriously damaged.

Capt. James Reid, of the Reid Wrecking Co, has announced that he will float the wrecked steamer Spokane on Gull rock, Lake Superior. Although the Spokane is in very bad shape, he is confident that he can release her and work will be begun at once.

The little tug Myrtie, which ran on the rocks in the Niagara river recently, was pounded to pieces in the heavy weather last week and is a total loss. She was valued at $4,000, and was engaged in towing scows used in the construction of the Black Rock ship canal.

Col. G. J. Lydecker, government engineer in charge of the central division, embracing the great lakes and other territory, retired last Friday on the age limit. Col. Charles E. L. B. Davis, district engineer, has been temporarily appointed to succeed Colonel Lydecker.

The steamer Orinoco of the Davidson fleet, while towing the disabled barge Chieftain on Lake Superior on Sunday last, broke her steering gear, the two boats separating and drifting about helpless. Both vessels were picked up by passing steamers and towed to Duluth.

The Craig Ship Building Co. have called for bids for the erection of buildings and improvements to the water front at their new plant at Long Beach, Cal. Plans were prepared by Chief Engineer Baker of the Craig company. The cribbing and bulkheading in front of the plant will be 600 ft. long.

Maj. Graham D. Fitch, government engineer at Duluth, has instructed the bridge tenders at Duluth to report to him the names of the ships passing the Northern Pacific draw bridge which neglect to blow the necessary signal for the opening of the bridge, as prescribed by the rules. Major Fitch will notify the owners of the boats reported to him, and call their attention to the penalty which can be inflicted upon them for this negligence. The owners of offending vessels thus far are the Pittsburg Steamship Co., the Interlaken Co., S. P. Cranage, Farrar Transportation Co., Gilchrist Transportation Co., James Corrigan, and the United States Transportation Co. In view of the numerous and disastrous collisions which have occurred between vessels and bridges during the present season, Major Fitch is to enforce the rules vigorously.

OBITUARY.

Franklin Bates Polson, president of the Polson Iron Works, Ltd., of Toronto, died suddenly at his residence, Toronto, on Oct. 28, aged 50 years. He had latterly been subject to indigestion and had a severe attack of illness on the 27th, but seemed to be much easier just before his death. He was born at Port Hope, Ont., and after a long experience as an engineer, during which he filled several prominent positions in 1883, founded with his father the Polson Iron Works, which developed into one of the largest ship building and engineering establishments in Canada. The first steel steamship ever built in the Dominion was constructed by them for the Canadain Pacific railway and they have carried out many extensive government contracts. Mr. Polson occupied a prominent position in the commercial circles of Toronto. He was an active member of the technical school board and an enthusiastic yachtsman. He leaves a widow and five children.

Bids for the repair of the transport Logan were opened at San Francisco last week as follows: Union Iron Works, $295,452; Risdon Iron Works, $363,500; Heffernan Engine Works, Seattle, $408,311; United Engineering Works, $434,093; Moore & Scott Iron Works, $564.862. It is probable that contract will be given to the Union Iron Works, as its bid was not only the lowest but promised completion in the shortest number of days.

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A NATIONAL HUMILIATION.

It is announced from Washington that charters of foreign steamers to convey the coal required by the American battleship fleet on its voyage to the Pacific ocean are now actively being made, and that the movement of the coal has started. The British steamers Ribley and Towergate are to carry about 6,000 tons from Baltimore or Virginia to Punta Arenas, on the straits of Magellan, at $4.40 a ton. The British steamers Hermiston, Earl of Douglas and Falls of Orchy and the Norwegian steamers Hektor and St. Andrews will load 25,000 tons for Callao, Peru. The Norwegian steamers Tricolor and Thor and a British vessel have been chartered to convey about 18,000 tons from Baltimore or Norfolk to the navy yard at San Francisco at $5.75 a ton, or to Magdalena Bay at $6. The British steamer Mombassa has been engaged to carry 5,500 tons of coal from the Chesapeake to Manila Bay at $4.35 a ton. These steamers will all load and sail within the next month or six weeks.

Dutch and Italian ships have also been chartered, and the needs of the United States thus benefit Europe by propping up a weak ocean freight market. These foreign steamers, when they have delivered our navy coal on the Pacific coast, expect to load in British Columbia for Australia on the Orient, and discharging there, reload a third cargo for Europe, thus circumnavigating the world, earning three freights and returning satisfactory dividends to their owners.

But the vital point of interest to the American people and to their lawmakers in congress is the demonstration which is being given that the great, rich and powerful United States government of 1907 is unable to move its battleship fleet from American ports on the Atlantic to American ports on the Pacific without invoking the aid of foreign flags and foreign governments to convey the indispensable coal. And this is practicable only in a time of peace. In war the navy department could not use these foreign ships. It would be a violation of the laws and principles of neutrality and, more than that, it would be suicidal even if these laws did not prevent. For the owners, officers and crews of these foreign colliers would have no interest in risking their property or their lives in the American service. They could not be depended on to "play fair." They would scuttle for their home ports at the outbreak of hostilities, and we should be fortunate if the fuel which our gold had bought did not turn up at the naval stations of our enemy.

It should not be forgotten that though a few American steamers were offered to the government on time charter to San Francisco Bay, their total capacity would not exceed the amount of coal required by the navy there and would not provide at all for the 100,000 tons which must be loaded into the bunkers of our warships at the way stations along the South American coast between St. Lucia in the West Indies and Magdalena Bay in lower California. In a war emergency coal could be transported by rail overland to San Francisco and Puget Sound. But a battleship fleet cannot go around Cape Horn or through the Straits of Magellan without recoaling several times, and it must have ships, American ships, officered and manned by loyal American seamen, to convoy the fighting vessels and provide the coal without which, as Congressman Littlefield has well said, our armorclads are as idle and useless as painted ships upon a painted ocean.

This Pacific cruise of the battleship fleet is the most vivid object lesson of the need of a merchant marine that has come before the eyes of the American people since the Spanish war. Here we have built in our country an enormous navy, the second strongest navy in the world, and we have utterly neglected to supply it with its indispensable auxilary of a naval reserve of ships and seamen. In other words, we have been as blind as Russia, which built a lot of battleships without paying any heed to the necessity of an auxiliary fleet, with a large supply of trained and hardened sailors. Our republican government in this matter has shown itself every bit as ignorant and incompetent as the autocratic government of the Czar—or rather a large proportion of the members of our house of representatives have shown themselves as ignorant and incompetent.

The blame is not upon President Roosevelt or the members of his administration or the great and powerful leaders of the majority party in the United States. The responsibility for this demonstration of our maritime impotency which we are now making to the world rests squarely upon the

shoulders of a portion of those representatives of the agricultural west and south who are now demanding that congress appropriate untold millions for deepening the waterways of the Mississippi valley. These are the men who have resisted every appeal of American presidents for a few million dollars annually for the encouragement of American ocean navigation. And these men need not be surprised if their demand for millions and millions of money for their own people and their own sections should now meet with a cold response from the people of the seaboard and commercial states, in view of the spectacle presented next December of the American battleship fleet convoyed by foreign colliers and enabled only by the courtesy of foreign governments to make the voyage from the American port of Hampton roads to the American bay of San Francisco.

FREIGHT SITUATION.

It looks as if navigation were to close in a week. Brokers are having difficulty in placing vessels, as nearly all the shippers are about through. The Steel Corporation will suspend shipment of ore from the mines on Nov. 30, and after this week practically no boats belonging to the fleet of the Pittsburg Steamship Co. will be sent from Lake Erie for ore. During the past few days the weather has been favorable to shipment of ore and a considerable quantity has been moved, but furnaces are so well supplied that should weather conditions make it difficult to load, shipments will cease altogether. In fact, everyone feels that all the ore has been moved that will be needed for a long time.

Coal has been coming to Lake Erie docks a little more freely during the past week. Vessels that take coal to the head of the lakes this week will be laid up there. While more coal has been moved this year to Lake Superior than ever before, the consumption has been greater and the available supply is not large.

The grain trade seems to be practically at an end.

HIGH LEVEL BRIDGES IN CLEVELAND.

An important meeting of the harbor committee of the Cleveland chamber of commerce was held in the library of the chamber on Tuesday, Nov. 19, and was presided over by Harvey D. Goulder. The committee on bridges was present by invitation as were also the leading vessel owners of Cleveland. The general subject discussed was the height of viaducts across the Cuyahoga river, though Mr. Goulder desired it to be understood that the Lake Carriers' Association as a body was in no way identified with the movement of fixing a definite height for these structures. The purpose of the meeting is well expressed in the following letter which Mr. Goulder caused to be sent to all of the ship yards on the lakes:

"The matter of head room or clearance at fixed viaducts in Cleveland is before a committee of which I happen to be chairman. It looks as if at what is known as the Central viaduct a clearance of 100 ft. above the mean stage of water can be secured without special difficulty. At the Superior street viaduct it is claimed that so high a clearance as 100 ft. can only be obtained by having four per cent grade from Water street or else by extending the grade up as far approximately as Bank street. There seems no objection to a grade from Water street west to the bridge proper, except as lies in the practical question of the permissible or appropriate rate of grade. If practical limitation of the grade should require the beginning of the approach as far back approximately as Bank street, it would much inconvenience the adjoining property and the crossing of Superior street between Bank and Water streets.

"It is said that if ships could be accommodated with a clearance of 90 ft. a practicable grade will be had from Water street west.

"The desirability of having in the future fixed viaducts is mutually important to the ships and to those who have to pass over the river by means of the viaducts. A very distinct disposition of mutual accommodation seems to pervade the whole question with a view to obtaining fixed structures without draws giving ships the necessary clearance and at the same time reducing the grade to a point reasonably convenient and, as far as possible, economical in the erection and maintenance of the structures themselves and adapted to the convenience of those who are required to use them.

"The law requires a steamer to carry the head light 40 ft. above the hull, unless her beam is less than 40 ft., and then the limit is the beam of the boat. For the after range light the requirement is that it shall not be less than 75 ft. abaft and not less than 15 feet above the forward light.

"Some question has been made as to whether this is to be measured from the deck or the hull on even keel. As there is no reference to the deck or the hull in connection with the after light, but its height is merely required to be 15 ft. above the forward light, and taking into account the design to have a range consisting of the forward light and a higher after light, my understanding is that these lights should be so adjusted that in whatever trim the ship is the after light will be 15 ft. above the forward light for the purpose designed, that is, having a range.

"Our committee would be very much obliged if you would go over this question as carefully as your convenience will admit and give us such information as you can from the practical standpoint of the ship designer."

The replies to this letter were various, the most thorough being presented by Robert Logan, general manager of the American Ship Building Co., who held that the after light of a modern ship would be 87 ft. above the keel, and Charles Calder, general manager of the Toledo Ship Building Co., who figured it at 89 ft.

Dr. Charles S. Howe discussed the needs of the city, holding it to be divided into two parts, each a considerable city in itself, but that if both are to be developed to their fullest extent there should be free, full and uninterrupted communication between them. The bridges should be numerous and available at all times. A bridge with a draw is not available at all times, and is moreover a source of danger. He thought that all viaducts spanning the river should be high level bridges. No problem is involved in making the Central viaduct a high level bridge, but quite a serious problem is involved in the Superior street viaduct. If the bridge is to have a clearance of 100 ft. above water level it will necessitate a four per cent grade, starting from Water street. This grade could be achieved without perceptible damage to property. The grade could be lessened by starting the approaches at Bank street, but not without serious damage to property on Superior street. Any attempt to start the approach at Bank street would probably result in protest from property owners. A four per cent grade of course would make it impossible for teams to carry their present loads across the viaduct. He thought that if vessel owners would be content with 90 ft. clear-

(Continued on page 33.)

OHIO VALLEY IMPROVEMENT ASSOCIATION

The convention of the Ohio Valley Improvement Association held at Wheeling, W. V., on Nov. 14 and 15, marked the thirteenth milestone in the history of the association. In numbers and in enthusiasm it took rank with any former convention, and under the leadership of Col. John L. Vance, its courteous and popular president, this meeting contributed its quota to the progress of this great movement. Many old faces were recognized, and with them many new ones, and there was constant evidence that the work of education which has been carried on so vigorously is continuing to bring forth abundant fruit in constantly enlisting new recruits.

All of the sessions of the convention were well attended and close attention was given to the various entertaining speeches and addresses which presented the improvement from all points of view. Although but two days were consumed there was a night session on the first day, and as usual a large amount of business transacted. The report of the secretary and treasurer, Capt. J. F. Ellison, showed that the finances were in excellent shape, and the disbursements supervised in a careful and businesslike manner. The balance in the treasury evidenced that business men and organizations throughout the valley have not confined their interest in this important improvement to mere words of mouth, but have constantly and consistently backed up their endorsement in a financial way. It would take a volume to present the bristling array of facts and figures enumerated by speakers at the meeting, and only a cursory mention can be made of them here.

The convention was called to order Thursday morning, Nov. 14, in the auditorium of the Carroll Club, Wheeling, W. Va., which was suitably decorated for the occasion, an immense streamer "'On to Cairo" being hung over the proscenium arch. Large posters announcing the meeting of the National Rivers and Harbors Congress at Washington on Dec. 4, 5 and 6 next, were given a conspicuous place on the walls.

The convention was called to order by Mr. W. Alfred Wilson, secretary of the Wheeling board of trade, in the absence of H. C. Franzheim, its president. Mr. Wilson called attention to the absence of Mr. Franzheim, saying that he was out of the city and was not able to get there until the afternoon. He also spoke of the general regret caused by the absence of Gov. William M. O. Dawson, who was unable to reach Wheeling for the opening.

Hon. W. P. Hubbard, representative in congress from the First District of West Virginia, delivered an address of welcome in behalf of the city of Wheeling. After recounting the early struggles of the Association and its fight for life in which the people of Wheeling had had a part, he compared the association in its progress to the Ohio river itself, which broadening as it flows through the valley finally brings to the ocean the rounding completion of its work. The conservation of forests, the prevention of floods, the protection of streams and the drainage of swamps are all a part of the steady progressive movement of the country, in addition to the project for the deepening and broadening of the river channels. The waterways were neglected when the railroads first came, but now that the industrial growth of the country exceeds its transportation facilities recourse must again be had to the waterways, and congress should make appropriations for the improvement of our rivers with as much regularity as other appropriations are made. Only in this way can we make full use of the Panama canal. He referred to the navigable waterways as the greatest asset that the country can have. Adverse public sentiment to internal waterway improvement has now entirely disappeared, as well as the opposition of other transportation interests, and substantial encouragement is being given on every side. The speaker paid a high tribute to the great work performed by the Ohio Valley Improvement Association in paving the way for other similar associations throughout the country. A hundred congressional districts will be benefited by the carrying out of this project, and the time will come when all of the delegates will be able to come back to Wheeling by water on a 9-foot stage, and will be accorded just as warm a welcome as at the present time.

Mr. Edwin C. Gibbs, of Cincinnati, responded to the address of welcome, holding it most proper that the convention should meet in Wheeling, the first town laid out on the Ohio river. After recounting some of the early history of Wheeling he prophesied its rapid growth in the future when the improvement of the Ohio shall have been brought about, and in closing paid a high compliment to the services of the various officers of the Ohio Valley Improvement Association and referred to pronounced change in public sentiment during recent years in favor of this movement, due primarily to the work of this association. Although the Ohio river at this time occupies the first position, it will take hard and persistent work to maintain it as such before the rivers and harbors committee in the future. The time of planting has gone by, and it is now time to gather in the harvest of our labors.

Colonel Vance read a letter from Mayor Schmidt in which he expressed much regret at his inability to be present at the convention and his earnest and sincere hope for the success of the efforts.

PRESIDENT VANCE'S ANNUAL REPORT.

The annual report submitted by President Vance was a comprehensive document reviewing the work of the year. In the opening of the report President Vance after referring to the active work of those connected with the association and acknowledging the cordial support of the members in every section, commented on the fact that the entire country is now awakened to the importance and necessity of improved waterways, particularly the great inland waterway. He took pride in attributing this awakening in large part as due to the work of the Ohio Valley Improvement Association, which has labored continuously and persistently for more than thirteen years, undaunted by difficulties and opposition that at times seemed insurmountable and which would have proven disastrous but for the unwavering confidence of the members of the association in the justice of their cause. Their efforts must be continued until results have been secured beyond possibility of revocation.

President Vance enumerated certain appropriations heretofore made, and the distribution of same, congratulated the association on the benefit these would produce in enhancing the commerce of Ohio. The amount of money appropriated by the act of March 2, 1907, is larger than that for a like purpose in any preceding river and harbor bill in the history of the country. The act is also admitted to be the most valuable and comprehensive in all its parts. Provision is made for the completion of a much larger proportion of projects.

than in any preceding measure, and the result is the providing for important works that have been pending for years.

President Vance referred to the creation by President Roosevelt of what is known as the inland waterways commission, and explained its personnel. President Vance thought that it is the universal opinion that the president's appointment of this commission for the purpose specified is the most important in its bearings of any he has taken during his administration for the benefit of the commercial interests of the country, and he thought that in this action President Roosevelt had been largely influenced by the results of the convention of the National Rivers and Harbors Congress held at Washington Dec. 6 and 7, 1906, and which was in numbers and influential delegates the most notable ever held in the United States for the purpose of advocating the improvement of internal waterways. The work of this commission will be watched with interest by the people of the entire country. Colonel Vance anticipated that the report of the Board of United States engineers setting forth the results of their examination and survey of the Ohio river will no doubt be presented to congress at the approaching session. President Vance reviewed the proceedings at the hearing of the board of engineers for rivers and harbors at Pittsburg, Pa., on Aug. 12 last, at which there was a large and representative attendance. President Vance believed that there is today a greater and more widespread sentiment in favor of waterways improvement than ever before in the history of this country. Influential newspapers and magazines in every section, many of which have in the past given but slight attention to this class of public improvement, are now open and avowed advocates for the special waterway improvement that most concerns their locality. He complimented the work of the National Rivers and Harbors congress through its well established and carefully handled bureaus of publicity, aided by speakers of undoubted prominence and ability, who are building up a sentiment favorable not to any particular project but to a policy by the national government which when consummated will be of direct and permanent benefit to every section having a just and meritorious claim for river and harbor improvement. He held that among these the Ohio river improvement stands without a rival, because it is the one river in this country that carried tonnage from its source to its mouth, the volume of which is greater than that of any unimproved river in the world. The West Virginia Board of Trade in session at Elkins in October, adopted a report and resolutions relating to waterways, through a committee of which Hon. W. P. Hubbard was chairman, which is an able and convincing argument in behalf of the improvement of waterways that will command unqualified commendation.

The report of the secretary and treasurer, Capt. J. F. Ellison, of Cincinnati, showed that the finances were in excellent shape and that the association has abundant resources to carry on its aggresive campaign.

ADDRESS OF CONGRESSMAN DALZELL.

After recess John Dalzell, M. C. from the 30th Pennsylvania district, now addressed the convention. He paid a high tribute to President Vance and said that all hoped he might live long enough to see the fruition of his life's work. He paid an encomium to Capt. Dovener, who had always worked for the improvement of the Ohio river. In the present period of greatly increased production along all lines the question of transportation is paramount, the railroads being inadequate to take care of the production. He quoted the statement of James J. Hill regarding the greatly congested condition of the business of the country, to relieve which it would require the building of at least 73,000 additional miles of railroad that would cost over $5,000,000,000. The Ohio river serves a population of over 15,000,000, and at the head waters of the Ohio there is produced more coal than France, Belgium, Great Britain and Germany. More steel rails are produced in Pittsburg than are made across the water. Pittsburg makes more plate glass than the whole of the balance of the United States, and produces more petroleum compound save Russia and the rest of the United States. The Pittsburg district furnishes 60 per cent of the coke in the United States and makes most of the crucible steel, tubing and many other products. The tonnage of the Pittsburg district annually exceeds the aggregate tonnage of five of the world's great ports, New York, London, Liverpool, Hamburg and Antwerp. Last year it reached the amazing figure of 123,000,000 tons. All this tremendous output is dependent for its transportation on the inadequate railroad facilities and the uncertain facilities that are afforded by the Ohio river in its present unimproved state. Any of the other cities along the Ohio will almost equally well illustrate the urgent necessity for the improvement of the river as well as of its tributary streams. The speaker then showed the immense difference in cost in favor of water transportation, stating that one steamer recently towed from Louisville to New Orleans 70,000 tons of coal at a cost of one-third of a mill per ton per mile. While the trip was made as expeditiously in all probability by water as it would have been by rail, the water cost was only one-twelfth of what the rail cost would have been.

SPEECH OF CONGRESSMAN FOSTER.

Hon. John H. Foster, M. C. First Indiana district, stated that he agreed with President Roosevelt that the time for speaking is past and the time for action has come. The country has been railroad mad, and transportation by water should now be given more attention. Mr. Foster believed that appropriations in the future will be more liberal, because the people have been educated to demand them. The position of the Ohio river in the center of population and production should justify its receiving the first attention of congress. Even in its present condition it has a greater commerce than any other river, and it should be first improved because it is going to furnish the greatest tonnage to other rivers. With the Ohio river improved it has a potentiality, at Evansville and at other points, for 20 Pittsburgs. In conclusion Mr. Foster pledged his continued support.

Judge Lewis M. Hosea, of the superior court of Cincinnati, briefly addressed the convention. He said that it needs no gift of prophetic vision to see what the improvement of the Ohio means. It will fill the valley with a great number of contented manufacturers who will have no trouble with trusts, as the Ohio river gives no rebates, and with the outlook for the population to be doubled in the next 40 or 50 years, the need for improvement is manifest. Judge Hosea stated that at the biennial session of the Ohio legislature he found that the entire senate was in favor of abandoning the canal system, but believing that the canal in connection with the Ohio river would be one of the greatest blessings to all industries, through the efforts of himself and others he had succeeded in bringing about a complete change of sentiment, so that the canal was not abandoned.

VALUE OF SHIP CANALS.

John E. Shaw, president of the

Ohio River Ship Canal Company, declared himself as one who was tired of pessimism. He had great faith in Uncle Sam even if he had lately stubbed his financial toe. He believed that the country is about to enter upon the greatest period of expansion in wealth of production in the two hundred years of our history. In building a house we must first ask, "Can we afford it, will it add to our comfort, convenience and happiness;" and the government in the building of a waterway system must take the same view.

In 1850 the products of the country were valued at $7,000,000, and in 1907 the mineral products equaled half of those of the world, or an increase of 200 per cent, and the country has but 5 per cent of the population of the world. In 1880 we passed England in the rank of manufactures, and since then we have passed in everything else, and every sunrise sees $10,000,000 added to the tangible wealth of the country, and in other words the result of six days would provide 9 feet of water from Pittsburg to Cairo. Can we afford it? It doesn't need any answer.

"The building of waterway improvements should first be along the lines of already moving tonnage. In this country the currents of freight shipments are from east to west. From New York city to Beaver, the mouth of our proposed canal, is 750 miles by water. Add the Ohio river to that and you have an east and west line of 1,660 miles to the Mississippi, and from Beaver to Lake Erie makes possible the shipment of the southern products to New York by water in place of being bottled up at Pittsburg. This makes the imperative demand for the immediate improvement, and when this is done it will be possible for 24 states to interchange their products on water and at a cost for moving it seven miles of the cost of one mile by rail.

"Does the money put in locks and dams pay? The Suez canal cost $100,000,000, and the tonnage is about that of the Ohio river, and its net receipts have at times been as high as $20,000,000 a year, and its stock is higher than that of Standard Oil. Then look at the Panama canal. At the close of the century it should have an income of $48,000,000 annually if it grows in the same proportion as the Suez.

"The Lake Erie ship canal will cost $60,000,000, and right along where we propose to build the canal is moving about 60,000,000 tons of freight a year. Over 50 per cent of the Detroit river tonnage is from Pittsburg, and the Pittsburg tonnage has doubled itself in six or eight years.

"As to the system, I suggested a belt line waterway in the country, and I believe that those that have the tonnage now should first be built. It touches the grain and oil centers of the northwest, the cotton and sugar of the south and the coal and coke of the east, and has an outlet to the Gulf and to the Atlantic. From this belt line waterway we see the extensions that are possible and the Lake Erie ship canal comes first in importance, but is eliminated, as it has been given by the government to private people to build. That leaves the Ohio then first, and it stands out pre-eminently as the first in the good it would do to the government. The third should be the extension of the Chicago drainage canal."

Referring to the ship canal, Mr. Shaw stated that the company was ready to take up the construction as soon as the financial matters adjust themselves, and continued: "I wish to say that there are men here today who will not only see the Lake Erie & Ohio canal built and the Ohio improved, but they will enjoy the fruits of them. I have great faith in Uncle Sam, and he will soon be up and doing and accomplish greater things than he has ever accomplished."

NOMINATION OF OFFICERS.

For President—John L. Vance. For Secretary-Treasurer — J. F. Ellison. For Vice Presidents—W. B. Rodgers, Pittsburg, Pa.; Jas. A. Henderson, Pittsburg, Pa.; Jno. H. Jones, Pittsburg, Pa.; Hullinen Quarrier, Wheeling, W. Va.; D. A. Mossman, Huntington, W. Va.; B. W. Peterson, Wheeling, W. Va.; B. S. Pope, Parkersburg, W. Va.; Albert Bettinger, Cincinnati, O.; H. A. Marting, Ironton, O.; D. J. Sinclair, Steubenville, O.; J. E. Williams, Portsmouth, O.; W. W. Hite, Louisville, Ky.; W. A. Patton, Catlettsburg, Ky.; S. A. Fowler, Paducah, Ky.; W. C. Williams, Louisville, Ky.; F. B. Posey, Evansville, Ind.; M. C. Garber, Madison, Ind.; Chas. Hegewald, New Albany, Ind.; I. H. Odell, Evansville, Ind.; Geo. Parsons, Cairo, Ill.; J. C. Willis, Metropolis, Ill.; E. A. Smith, Cairo, Ill.; J. F. Browinski, Joppa, Ill. Executive-Finance Committee — Edwin C. Gibbs, chairman; John L. Vance, Geo. Puchta, O. F. Barrett, Paris C. Brown, J. F. Ellison, Albert Bettinger, M. B. Farrin.

THURSDAY EVENING'S SESSION.

At the night session on Thursday the first speaker was Hon. W. E. Cox, M. C. third Indiana district. He paid a glowing tribute to the pioneers in river improvement movement who so manfully struggled for many years against indifference and opposition. He commented on the fact that the increase of production in this country exceeds by 100 per cent the increase in railroad transportation facilities, and a continuous stage of water in the Ohio and Mississippi rivers, as well as the completion of the Panama canal, is urgently required. He pledges his own support for the cause in congress and out of congress, as he believed that the people were educated and ready for the improvement of the Ohio river.

Hon. James A. Hughes, of the fifth West Virginia district, said that his specialty was not public speaking, but being in the lumber business he belonged rather to the log rolling class. Some 50 congressional districts are interested in this improvement, and if the members from the other 49 would take the same interest as the speaker it will not be a hundred years before the improvement is made, but less than 10 years. If a guarantee could be given to the river men that in 10 years' time the river would be improved so as to carry a continuous 9-foot stage, fast and fine boats would be constructed and competition with the railroads assured. The average travel of a freight car is 13 miles a day, and at Huntington it is calculated that a steamboat is 10 days quicker than rail on shipments from Pittsburg. There is now a large amount of money in the United States treasury, and it can be expended in no better way than for river improvement. He complimented Congressman Dalzell on his speech and wished that he could have gotten the same man to write his. He favored an annual river and harbor appropriation, and pledged his support to it. He was proud of his home town having had the largest delegation to the last rivers and harbors congress.

Hon. W. M. O. Dawson, governor of West Virginia, was the next speaker, and after apologizing for his tardy arrival and explaining the cause of his absence to be due to failure to make railroad connections, he referred to the great natural resources of West Virginia and the possibilities for its great development consequent upon the completion of the Panama canal. West Virginia coal is the finest in the world, and would be preferred

in any market if it were given equal advantages as to transportation cost. West Virginia is now shipping over 30,000,000 tons of coal per year, and it costs on an average $1 per ton to ship it to market. What would be the advantage to West Virginia if this transportation charge could be reduced even as little as 10 cents per ton? When you reduce the cost of transportation you add to the material wealth of the country. The speaker had sometimes thought that it would be better for the state if not so much coal were mined at present, for ultimately when the cost of transportation shall have been reduced by internal waterway improvement, the worth to the producer will be more. The Big Kanawha and the Big Sandy are somewhat improved and the Monongahela to Fairmont, and now we need the Ohio improved. The river should be improved continuously and not scattering here and there. What would you think of a railroad that was built in parts and attempted to be operated with the alternate sections unbuilt? Until the entire river is improved the full value of the investment will not be realized. The speaker had suggested three years ago that the government issue bonds and go ahead and complete the work simultaneously at different points. If there are other rivers as necessary to be improved as the Ohio, then let the bond issue be extended, but only provided the money itself is not available. We want the entire thing completed, not a dam here and there, but the whole d——d thing! Congressman Hughes here interrupted with the statement that they had money enough without recourse to bonds. In conclusion the governor said he would remain in the city for the day, and would go with the delegates to inspect the dams Nos. 11 and 13.

Ex-Governor A. B. White was called on, and responded in a few happy remarks, favoring the continuous contract system as the best means of bringing about desired results.

CAPT. DOVENER'S SPEECH.

Capt. B. B. Dovener, whose devotion to river improvement in the past is well known, congratulated the convention on the large attendance and the evidences of enthusiasm generally throughout the country. He referred to the interest he had always taken in this movement for the improvement of the Ohio river, and the fact that he had attended the first convention of the association and had attended every meeting since. He believed that the manifest strong public sentiment now aroused would result in still larger appropriations, and hoped that all the friends of the improvement would stand by it loyally to the end.

The closing number of the program of the evening was a lantern slide lecture by J. Frank Tilley, descriptive of the locks and dams on the Ohio river. It showed various stages of construction and the operation of various types of dams. All the dams now completed were shown, as well as a river tow in process of making, the Pittsburg harbor and the various classes of craft. The Sprague, with its tow of 54 pieces, was shown on the Mississippi. During the course of the lecture views of various well-known Ohio river improvement enthusiasts and past workers in the great movement were thrown on the screen, provoking great applause. Among these were the lamented Capt. John F. Dravo, Col. John L. Vance, Capt. Albert Bettinger, Capt. Jas. F. Ellison and others.

FRIDAY MORNING'S SESSION.

On Friday morning immediately after the opening letters of regret were read from Hon. H. C. Woodyard, of Parkersburg, Hon. H. R. Warfield, of Morgantown, Senator E. C. Colcord, of Morgantown, ex-Gov. G. W. Atkinson, and Hon. Joseph E. Ransdell, the president of the National Rivers and Harbors Congress, who invited all to attend the meeting of that body to be held at Washington, D. C., on Dec. 4, 5 and 6, 1907. He said that when he in conference with his colleagues should frame a bill for river and harbor improvements he could cast his vote for the improvement of the Ohio river with an easy conscience and with the certainty of splendid results.

Gov. Atkinson, now Judge Atkinson, in his letter spoke of the convention held at Wheeling in 1898, when he stated to the association that the tonnage and general traffic of the Ohio river exceeded that of any other river in the world, and he stated that the same is true today. Within the past ten years the railroad business of the country has increased 110 per cent, the railroad mileage 21 per cent, and the other equipment in about the same proportion. This means with the present enormous production that we must look for better waterway means of transportation; and the writer then pointed out the importance of the Ohio and Mississippi valleys as being the greatest agricultural and business districts of the country and most in need of relief in matters of transportation. In answer to the question, "Does it pay?" it is manifest that river improvement has paid in every other case where applied, and it will pay particularly well in the Ohio valley for obvious reasons.

An invitation to visit dam No. 13 was received from the Hillenbach & May Contract Co. of Evansville, Ind., and was accepted.

Congressman Hughes paid a high encomium upon the work of Hon. Theodore E. Burton on the rivers and harbors committee, and on motion of Hon. Albert Bettinger, one of the vice presidents from Ohio, a resolution was unanimously adopted expressing the debt of gratitude felt by the people of the Ohio valley in particular and of the country at large, to Hon. Theodore E. Burton for his intelligent and studious attention to the subject of improvement of the waterways of the country. Capt. Bettinger expressed his belief that no man in public life has done more for the tremendous advancement lately made in this important direction.

RESOLUTIONS ADOPTED.

The following submitted by the committee on resolutions, Hon. W. P. Hubbard, chairman, was unanimously adopted:

The Ohio Valley Improvement Association, in its thirteenth annual convention assembled at Wheeling, W. Va., Nov. 14 and 15, 1907, reaffirm the declaration of principles approved by the association at its meetings in Parkersburg, 1902; Evansville, 1903; Huntington, 1904; Cairo, 1905; and Portsmouth, 1906.

First. We affirm as the sense of this association that the improvement of the Ohio river from Pittsburg to Cairo should be such as to provide a 9-ft. stage at low water; for the completion of which we respectfully ask that all appropriations necessary be made at the earliest practical time.

Second. This association advocates that improvement of the Ohio river be made according to the report and recommendation of the United States engineers approved by the secretary of war, and that when work is begun on a lock and dam it should be completed as expeditiously as possible.

Third. The promptness with which the United States engineers' commission, appointed to report generally upon the permanent improvement of the Ohio river, prosecuted the work assigned to it, and the open and fair manner in which the United States

Engineers' Board of Review proceeded to review said work and report, deserve and have the hearty commendation of this association, and to the end that said reports now on file with the chief of engineers may receive equally prompt attention by the congress of the United States, we hereby respectfully request the Hon. William H. Taft, secretary of war, to transmit the same to congress at the earliest possible date after the commencing of the coming session of that honorable body.

Fourth. We note with much satisfaction the constant growth of sentiment throughout the country for the improvement of our waterways, brought about in great part through the efforts of the National Rivers and Harbors Congress, wherefore, it is resolved that we continue our support of the said National Rivers and Harbors Congress in its efforts to establish permanently the policy of annual appropriations of not less than $50,000,000 for rivers and harbors improvements.

Fifth. That every delegate present at this convention pledge himself —either by personal interview or by letter, to urge the senators of his state and the representative of his congressional district, to urge vigorously the passage of a rivers and harbors bill at the coming session of congress. That the secretary of this association advise the senators and congressmen of the states of Pennsylvania, West Virginia, Ohio, Kentucky, Indiana and Illinois of this action of the association and convention assembled.

Sixth. That whatever scheme of improvement of the lower Ohio may be adopted pursuant to the report of the board of engineers, the locality below the mouth of the Green river, and the locality between the mouth of the Tennessee river and Cairo, should be given preference.

Seventh. Until the completion of the permanent improvements of the Ohio river, low water navigation is greatly benefited by the judicious use of dredging in times of low water Congress has promptly and generously responded to our previous request for provision for such dredging, and for this we hereby extend our thanks, with the hope that the policy of low water dredging may be continued.

Eight. We herewith renew our protest against the maintenance of narrow channel spans across the Ohio river, and commend the action of the war department in enforcing the laws of congress for the removal of such obstructions. We heartily endorse the plan proposed by the United States engineer's department for a bridge at Steubenville to replace the one now maintained by the P. C. C. & St. L. Ry. Co., so dangerous to navigation.

Ninth. This association recommends the maintenance by the government of an adequate force of engineers to be available for the prosecution of river and harbor improvements, to which end is suggested the appointment or employment of civil engineers from private life when necessary.

Tenth. This association expresses its thanks to the committee on rivers and harbors for the courtesy and kindness with which it has uniformly treated the representatives of this association who have appeared before that committee. We appreciate the great care and skill with which the engineers have dealt with the problem of the improvement of the Ohio river. We feel that they have solved the problems presented, with scientific accuracy, and have made no mistakes in the work heretofore done.

Eleventh. We commend the state of Ohio for its action in preserving its canal system. We urge that state not to abandon any of its canal property, but on the contrary to convert its present canals connecting Lake Erie with the Ohio river into barge canals to the accomplishment of which we pledge our hearty support.

ADDRESS TO THE HYDROGRAPHER.

Mr. M. O. Leighton, hydrographer of the U. S. Inland Waterways Commission, addressed the convention, saying at the outset that as there might be some misapprehension as to the exact scope of the duties of the commission, a word on that head would be in order. He explained that these duties were purely of a deliberative and advisory character, to place the president in possession of such data with regard to the general subjects committed to the commission, as the president, through absorption in his other multitudinous duties, might otherwise be unable to obtain. The commission was not for the purpose of advising congress, but rather the president himself, whose creation it was. It was not the intention that this commission should usurp any of the powers of congress, but to advise the president what was best for him to represent as to these subjects in his message to the congress. It is not reasonable to suppose that this commission can present a final report on these momentous matters and prepare same within the short space of nine months. He then commented upon the peculiar fitness of each member of the commission, they being selected from such various walks and viewpoints as to enable the combined commission to have the benefit of their combined experience greatly to the advantage of the entire body as a whole. The commission has no particular project in mind, and has no right to consider any particular project. The speaker then briefly treated of the prevention of floods by means of reservoir systems of storage of water at head waters. The commission would consider water power, navigation and stream polution. The speaker believed that there was every prospect of so utilizing the water power to be derived under his plan to make the same defray the expense of maintenance of the locks and dams that may be constructed. The utilization of the water power now going to waste meant the avoidance of a coal famine, which is now predicted at present rate of consumption within 70 years. The preservation of our forests is also a subject that is deeply connected with the question of internal waterways. He held that unless proper terminal facilities are provided water transportation will be greatly hampered.

COL. POSEY TALKS.

Col. Frank B. Posey, of Evansville, Ind., entertained the convention with one of his characteristic talks, full of wit and homely illustration. He literally brought down the house. In introducing him Col. Vance referred to Col. Posey as a "veteran in the cause of river improvement," and Col. Posey said that he could remember the time not so many years ago when Col. Vance was expounding the need of improving the river his appeals apparently falling on unwilling ears; he should, therefore, now feel all the greater sense of gratification that the whole country has taken up the movement for the betterment of internal waterways and that even President Roosevelt himself is in the fight heart and soul, and that the cause is being advocated by the leading public men and journals of the country. Col. Posey made the point that inasmuch as the gift of West Virginia was originally made to the Northwestern Reserve by the state of Virginia conditioned on the maintenance of open navigation of the Ohio river, that the government is under an implied trust to improve the river, since its navigation never can be free in the highest sense of the word other-

wise. The value of this river for navigation purposes is beyond conception, and if put up for sale a private corporation would be found that would put up $100,000,000 for the right to construct all necessary locks and dams, and when completed to charge a toll for navigation. Col. Posey's remarks were in an exceedingly happy vein and he was roundly applauded.

Rev. John McCarthy, of Huntington, spoke in introduction on the unselfishness of the practice of medicine and compared it with the services of an engineer, and declared that George Washington received his ideas as to a united country from his experience as an engineer when he explored in the Ohio valley. Congress of itself cannot do anything without pressure from the public, "and that's what we're doing here. Congress can't do anything without us," he said.

Rev. Mr. McCarthy spoke a word of praise for President Roosevelt for raising politics out of pettiness, and he said (speaking as a democrat who voted against Bryan) the Nebraskan was a force behind Roosevelt in this. He took up the work of other engineers, speaking of Lyman E. Cooley, who said "the minimum of transportation required in the United States is one mile of canal for every three miles of railroad," and cited what had been done in other countries. He offered proof to show the coming of the needs of increased water facilities. Rev. Mr. McCarthy declared that the Ohio Valley Improvement Association is engaged in a Christian occupation, so it is entirely appropriate for a minister of the gospel to be present.

Louisville was selected as the place for the next meeting.

The convention adjourned at noon on Friday, and the afternoon was devoted to an inspection of dams Nos. 11 and 13, the trip being taken by trolley and steamboat Royal. An excellent opportunity was enjoyed of inspecting a movable dam partly completed at No. 13, of the Chanoine wicket type. While water was not flowing over the wickets, a much better chance was had to see the actual mechanism than could have been had were the dam actually in operation.

The selling of tickets via the D. & B. line between Detroit and Buffalo has been discontinued. Steamers of the D. & C. line will continue to run daily between Detroit and Cleveland until Dec. 5. The steamer City of Mackinac made her last trip to St. Ignace on Monday last.

THE TRIALS OF THE MAURETANIA.

The Mauretania finished her official trials on Thursday morning, Nov. 7, when she entered the Mersey with the credit of being the fastest merchant steamer in the world. For just over 50 hours she steamed at an average speed of 26.03 knots, and later—on Wednesday—made a series of progressive speed runs on the measured mile at Skelmorlie, on the Clyde, including two runs at a mean speed of 26.04 knots. The Mauretania ran her 48 hours' trial on a course of 304 nautical miles—between Cornwall Point light, on the Wigtonshire coast, in Scotland, and the Longship lighthouse, in Cornwall, England. She began, says *Engineering*, with a mean draught of 32 ft. 9 in., which corresponds to a displacement of 37,000 tons—the condition the ship will be in at the beginning of her second day out from Queenstown. The draught conditions, therefore, assimilated to those in mid-Atlantic. We have, therefore, here a measure of the possibilities of the ship under the most favorable conditions, and with a well organized and adequate staff of trained officers and men. The results on the run may be first tabulated:

	Distance, Miles.	Time h.	m.	Speed, Knots.
First (southwards)..	304	11	34	26.28
Second (northwards)	304	12	2	25.26
Third (southwards ..	304	11	6½	27.36
Fourth (northwards).	304	12	2	25.23
Total and mean speed				26.03

The course was selected because its length could be traversed in about 12 hours, so that tidal influences on the north and south runs would balance each other. The chief consideration was the maintenance of steam, and from first to last the machinery worked splendidly. The coal was partly South Wales and partly Yorkshire. The stoking was well organized. In view of the large power developed it should be stated that at no time did the draft pressure in the ash-pits exceed ¾ in. The steam pressure was well maintained, and the mean for the 48 hours' trial being 180 pounds. The turbines worked with remarkable steadiness. On the 48 hours' trial they started at about 186 revolutions, but steadily increased, and for hours ran 193 to 194 revolutions, with very light variation. The maximum reached was 198 revolutions. The significance of this result will be better appreciated when it is here recalled that the weight of the revolving mass in the low-pressure turbine casing, for instance, is 125 tons, that the peripheral speed was about 9,350 ft. per minute, and that the clearance was only 8.100 in. In the case of the high-pressure turbines it was less. This long-distance trial terminated on Tuesday evening about 8 o'clock, and the vessel anchored until the morning near to the Skelmorlie measured mile, to await daybreak for the carrying out of a series of progressive speed trials. Runs were made at progressive speeds from 18 knots to full speed, and it was specially remarkable that the last, as shown in the table, were confirmative of the 48 hours' trial, revolutions averaging the same—190—and speed 26.04 knots. It was next decided to make runs between Holy Isle light and Ailsa Craig light, further down the Firth of Clyde, where there was more sea room, and the mean of the two runs there made was 26.17 knots. The results are tabulated:

Direction—	—Time— min.	sec.	Speed, Knots.
Northwards	3	13	18.65
Southwards	3	20	18.00
Mean speed, 18.32 knots; mean revolutions, 123 per minute.			
Northwards	2	50	21.17
Southwards	2	54	20.69
Mean speed, 20.93 knots; mean revolutions, 139 per minute.			
Northwards	2	35 1/2	23.17
Southwards	2	40	22.50
Mean speed, 22.83 knots; mean revolutions, 156 per minute.			
Northwards	2	21 2/5	25.46
Southwards	2	19 2/5	25.82
Mean speed, 25.64 knots; mean revolutions, 180 per minute.			
Northwards	2	21	25.53
Southwards	2	15 1/2	25.54
Mean speed, 26.04 knots; mean revolutions, 190 per minute.			
Ailsa to Holy Isle	37	35	25.60
Holy Isle to Ailsa	35	54	26.75
Mean speed, 26.17 knots; mean revolutions, 192 per minute.			

This completed, says *Engineering*, the interesting day's work, in the course of which opportunity was afforded of testing the governor gear. This gear is normally set to come into action in the unlikely event of any of the turbines exceeding 230 R. P. M. The steering mechanism also proved most satisfactory, and with rudder hard over, and all propellers running ahead, the diameter of the turning circle was but 2¾ lengths—a very good result. Excepting for the swell from the Atlantic which was experienced when the vessel was running between the Tuskar and the Longship on her four measured-distance runs, there was no opportunity of testing her behavior in a seaway. The periods of the roll and of the pitch were, however, found to be so long that even the maximum amplitude possible need not be disturbing to passengers. The period of the single swing varied from 10 to 12 seconds, according to the weights on board and their distribution, and that of the single pitch was about 4 seconds.

An announcement is made by the Cunard Steamship Co. that the new giant liner Mauretania covered 1,200 miles in her trial run, and made an average speed of 26.03 knots. The time which would be necesary to make the trip across the Atlantic at this speed would be four days and ten hours.

SITUATION AT BUFFALO.

Buffalo, Nov. 19.—Fall and winter problems are crowding in on the vessel owner again. They are in some instances pretty hard to meet, especially as the needs are so peculiar. At present the size of the winter fleet and the amount of winter grain storage are puzzling both the vessel owner and the elevator owner, if not also the grain shipper. Be it known, then, that Buffalo harbor is in just about the same condition for the undertaking that it has been in recent falls and though there is no certainty of a big winter fleet, either loaded or not, it is so likely to turn out about as usual that every effort is already making to find room for everything that offers.

The elevators have made their terms with the railroads during the past week and it is arranged that after Nov. 30, all grain in elevator will be forced into winter storage if it remains 10 days without being ordered out. This means 2 cents a bushel in the steel houses and 1¼ cents in the wooden, with additional insurance in the latter about enough to make up the difference. In fact that is the reason for the difference. These charges will no doubt give the harbor its usual big fleet to lay up loaded, for the nominal charge for winter storage afloat is only a half cent a bushel, added to the charter, though the owner of the grain quite often finds on arrival here that he wants to ship it on and unloads it at once, or at least in a month or two, when the vessel is ready for coal.

The railroads are doing quite a good deal better in handling grain than they were, sometimes furnishing cars in three or four days from the time of ordering them, instead of being 20 days behind their orders, as they were a month or so ago. They have already moved the 4,000,000 bushels that they were ordered to handle by the State Public Service Commission and are again contracting through grain about as usual. The elevators are pretty full, but there has not been the usual increase of receipts, the amount running about 3,000,000 bushels a week. There is complaint that much of the grain that would come here if the roads were equal to handling it is going to Georgian Bay ports.

Receipts for the season are a trifle more than for last season to date, being a little more than 100,000,000 bushels in each season. The additional handling for shipment out is probably due to the eagerness of the roads to stand well with the Public Service Commission and the resumption of business by the canal, after being tied up nearly two months by the break at Syracuse. Business is good enough to enable the canal to charge 5½ cents on wheat to New York, while carrying over three-quarters of a million bushels a week.

As to the harbor situation there is no change except that the vessels will average larger than ever before. There is no more room for winter stalls. The elevators and coal docks are holding off about taking lay-ups, for they have of late years, become more and more given to running during the winter. If they lease room to vessels they must wait till April 15 before they can do anything.

It looks now as though the coal docks would not like to pledge themselves to lay up till that time. They need a good-sized fleet to load before navigation opens in order to get as much done through the season as they need. They are over 700,000 tons in advance of last season now and all report that they are just as far behind their orders as they were last fall. To get this lead on former seasons they have strained every nerve for a long time and there has not been a slack spell from the start. Since July 20, the amount has fallen below 100,000 tons a week slightly for five times and it has not gone above 118,000 tons but once, the average being more than 100,000 tons a week for the whole time. This means that the docks have done all the business they could get, right along. They have been cut down both by car and mining shortages and the prospect is that last spring's loading of 250,000 tons before the opening of navigation will be exceeded next spring, beginning by mid-winter perhaps, if the coal and the room can be had.

The government has for some reason failed to rebuild the breakwater that was broken through by the big winter storm, having just fairly got started on it as the fall storms came on. The plan of tying up out there will not be given up for all that. There is plenty of breakwater that is sound and besides when the inner harbor is full there is nothing else to do. There is a move to secure money for deepening the entire outer harbor to 23 feet and when the chamber of commerce committee goes down to Washington to urge more liberal appropriations for such things it is likely that point will not be forgotten. This means that the inner harbor of any lake port is too small to make much of a show of taking care of the winter fleets, for Buffalo is as good as any and will look for the usual grain fleet.

Some day, when Buffalo gets through tangling up with railroad influence and politics and settles the question of deepening Buffalo river a few miles further, this harbor will be made much larger than it is. The work of digging the Niagara ship canal is progressing, though slowly, for it is mostly a hard rock problem, and then a harbor of some miles will be provided besides. The foresight of building the four-mile breakwater really saved Buffalo a bad shortage of winter harbor room.—JOHN W. CHAMPERLIN.

THE KELTON'S LONG TRIP.

The lake steamer Minnie E. Kelton has safely reached San Francisco after a journey of 16,467 miles. The steamer left Milwaukee on May 15. On June 4 she put into North Sydney, Cape Breton, with her boilers leaking. The steamer continued the long trip June 18, but her main mast breaking July 19, when she was 85 miles southeast of Santos, Brazil, she put about under sail and made that port July 28 without assistance. Leaving there on Sept. 11 the run to Punta Arenas, in the straits of Magellan, was made without incident, and only a day was spent there before resuming the trip. Coronel, the coaling port of Chile, was reached Oct. 6, and after taking in coal the Kelton sailed again two days later.

The only incident relieving the monotony of the long passage was the short visit paid to the island of Juan Fernandez, off the coast of Chile, where "Robison Crusoe" is supposed to have spent many years of his life.

The Kelton arrived there Oct. 10, remaining only a few hours after taking aboard fresh vegetables and fruit. That was the last stop until the steamer dropped her anchor in San Francisco.

MR. FARRINGTON'S APPOINTMENT.

Lake interests will be interested to know that W. C. Farrington, for many years president of the Northern Steamship Co. with headquarters at Buffalo, has been elected vice president of the Pacific Coast Steamship Co., and also of the Pacific coast railway, with headquarters at San Francisco. Mr. Farrington was latterly vice president of the Marine Insurance Co. of New York.

QUESTIONS FOR MASTERS AND MATES.—NO. 49.

656. What is the proper way of laying up a compass for the winter?

657. Is it best to put all the compasses near together in storing them?

658. After your boat has laid in one direction all winter, is it advisable to reverse her head before starting out in the spring?

659. State the effects and conditions in a case of the above kind?

660. What would you do before letting go a patent anchor to make sure of its starting?

661. How would you take the crew from a disabled vessel in a heavy sea?

662. Your quadrant gets broken, what would you do?

663. If a vessel steams N x E for 100 statute miles, how far would she be at the end of her course from the meridian she started from?

664. Supposing she steered 100 nautical miles instead of statute miles, how far would she be from the meridian she started from in nautical miles?

665. In your judgment do you think that lake steamers should be compelled to carry as part of their equipment, a properly constructed drag or sea anchor with sufficient area to hold the largest vessels into the wind during storms?

ANSWERS TO QUESTIONS FOR WHEELSMEN AND WATCHMEN.

TWENTY-FIRST INSTALLMENT. PUBLISHED OCT. 31.

236. Any line forward of an athwartship line on board is forward of the beam; any bearing less than eight points from the course.

237. Properly speaking, a ship's beam is her greatest width.

238. No. Abeam means at right angles with the keel; as the light bore abeam. The beam and abeam are often used the same, as the wind forward of the beam or forward of abeam. Forward of abeam is the more proper.

239. In the direction of abeam, crosswise.

240. Yes.

241. The center of the ship, along a fore-and-aft line; over the keel line. Also the middle portion of a ship, as the amidships section of the hull.

242. A fore-and-aft line drawn directly over the keel.

243. A fore-and-aft line may be drawn parallel with the keel line of the vessel, but an amidships-fore-and-aft line is a line directly over the keel, that is, coinciding with the keel. The stem, masts, smokestack, etc., are in the amidships-fore-and-aft line.

244. In the center of the ship.

245. No difference.

246. From SSE to WNW by way of north.

247. From SW to NNW by way of west.

QUESTIONS FOR WHEELSMEN AND WATCHMEN.

TWENTY-THIRD INSTALLMENT.

258. You are steering NNE and an object bears 2 points forward of abeam, what is the bearing by compass?

259. How do you lay a course on a chart?

260. How do you find the direction of any line drawn on the chart?

261. What is a true course on the chart?

262. What is a meridian?

263. Where is the greatest amount of friction and wear on the steering cables?

264. What can you do to reduce this friction and wear?

265. What is a sheet or common bend?

266. What is a reef knot?

267. What is variation of the compass?

268. Where do you find the variation of the compass?

269. How do you allow for it?

270 . How much and which way is the variation at Duluth?

271. How would you find the true direction of Duluth piers?

272. If you did not know and you wanted to find out what kind of a light on Duluth piers and on which pier, how would you find out?

THE LAYING UP OF COMPASSES.

When boats are placed in winter quarters it is recommended that the pilothouse or steering compass be left in its place, but thoroughly covered with old bedding or otherwise, to protect it from the cold; and the colder the place laid up at the more particularly this should be attended to. Where the upper or bridge binnacle cannot be removed, or any other binnacle whose position exposes it to the cold, its compass should be taken out of its gimbal ring and stowed away where it will be least sensible to any magnetic disturbance, either from changes in the ship's magnetism or from outside influences, alongside, etc. This compass should likewise be thoroughly covered to protect it from the cold. When stowing a compass away on board be careful not to place it close to a steel bulkhead, and also away from the steel deck— as far from iron on all sides as possible. Probably as good a place as any is in the master's room on a wooden table placed in the center of the room. Two compasses should never be placed close together for any length of time, especially in the case of storage. A compass should be laid up in a place as free from magnetic disturbance as is possible, and care should be taken not to have it come within the influence of such strong disturbances as an electric lighting plant, trolley wires and currents, electric working apparatus, etc. Properly, all compasses should be taken off the boat, and laid up ashore, and no two compasses should be placed within 15 ft. of each other, and the farther away the better. Where compasses are left on board for the winter and subjected to the ship's magnetism and its changes, and also to magnetic influences outside of the hull, they should have free gimbal action, thus affording the compass needle to move freely and respond to the changes that usually take place in a ship's magnetism by induction, and also to any disturbing effect that may take place on the outside of the ship. All bodies having magnetism have the power of making other bodies magnetic that are capable of receiving magnetism. The process is that of induction and not only takes place under very peculiar circumstances, but under varied conditions as well. A stronger magnetic body is not only capable of decreasing the magnetism of another body having a less intensity but is likewise capable of reversing its poles. Many times it simply changes the position of its poles, thus weakening the original magnetism. It may also increase the amount of the original magnetism if the magnetism of the inducing force is in the same line with opposite poles to each other. As a rule the magnetism acquired by induction is lost in time, and a short time at that, after the receiving body is removed from the inducing effect, and especially when the body induced has been reversed. The earth being a magnet it also has this inductive property and is not only capable of making magnetism in other bodies but to change it as well. The earth's inductive force is in the same line with the magnetic meridian of any place, being also one of the forces that gives action to every compass needle. An example will better illustrate this: Supposing the case of a steel hull built with her head north magnetic, the bow end would then have north and the stern end south magnetism. The hull acquired its magnetism from the earth's inductive force, that is, simply by the earth's magnetism passing through the hull. Now, imagine this hull laid up for the winter heading south, and you will at once see that the earth's magnetism is in direct opposition to that of the hull, the earth's north polarity comes in contact with the ship's south polarity. After the hull has laid in this same direction for a long

time the earth's magnetism passing through the hull incessantly has the effect of changing the magnetism of the hull to its own direction; that is, north polarity toward the north and south polarity toward the south. The longer the hull remains in this position the weaker its magnetism becomes, because the earth's magnetism is continually antagonizing it and as a consequence, gradually overcomes it. If the hull were left long enough it could have the further effect of actually reversing the poles of its magnetism, that is, the north pole would now be at the stern and the south pole at the bow. Now, imagine an ore pile or an electric power house close to the hull, and say its (the power house) magnetism is exerted in some other direction than that of either the ship's magnetism or that of the earth. The stronger of these forces will take precedence. If the disturbing force on shore is stronger than the earth's force, or the ship's force, which would be very likely the case, the hull's magnetism will change to coincide with it. The action of these two forces will, of course, complicate the direction of the changed magnetism. Many times the effect is to produce what is known as consequent poles in the ship's magnetism, and that is poles lying near to the regular poles. When the inductive force makes an angle with the direction of the ship's magnetism the effect is to weaken the original magnetism and to start another line of magnetism in the hull where it comes in contact with the hull, and its opposite pole will be where it leaves the hull.

As already stated, induced magnetism is gradually, if not quickly, lost as soon as the ship gets away from the inducing force, and the effect then is the restoration of the ship's original magnetism, or that to which the hull had settled or would settle were it not disturbed by any other force than that of the earth's magnetism, such as the ordinary conditions of a vessel in commission—moving about enough so that the earth's inductive force has no chance of striking the hull at one and the same point for any long length of time.

It is both the earth's inductive force and such disturbances as mentioned on shore, that is responsible for compasses being so much different in the spring than they were the fall before, and also, for the same reason that the compass gradually comes back to its old courses —the induced magnetism is leaving the hull and the original magnetism is again acting on the compass. Now, when the compass is left on board for the winter it too comes under these inducing effects, which may either increase or decrease the pointing power of the compass needles. The change may only be a slight one, but the effect a very large one, for it takes but very little to throw a compass out. A compass stored ashore would not be subjected to these influences, and as the magnetism acquired by lying in one direction for a long time is only transient, and is lost both by getting away from the inducing force and also by reversing the hull at its mooring slip, it is recommended that before starting out in the spring that every ship have her head changed to the reverse direction in which she lay during the winter, and that this be done some time before the compasses are brought on board. This would further insure that the compasses would not be subject to the usual changes in the ship's magnetism that take place during the winter. Not only this, the transient induced magnetism acquired by lying in the one direction would be reduced to the minimum, and that before the vessel ever started out in the spring. Very little change would take place in the ship's magnetism after she got started in the spring if these recommendations were carried out. Not only this masters would find that their compasses worked much better and could be relied upon, whereas, as now, little or no dependence can be placed in them. There is also the further advantage of not having to wait a couple of months for this magnetism to be lost. Adjusting the compass in the spring does not improve it in the least, because the compass is adjusted for the then present conditions of the ship's magnetism. Neither will the adjustment have any effect of stopping the loss by induction or in counteracting the effects. The expense of carrying out the above recommendations would be very small, and insignificant compared with the resulting value.

It is further recommended that every boat be slowly swung both on a port and a starboard helm at the beginning of the first trip in the spring. This is especially recommended where boats have been bunched during the winter and no chance of reversing them in the spring. It should be done anyway, even where a vessel has been reversed before starting out, as too much attention and precaution cannot be given and taken in all matters connected with a ship's compass.

It is further recommended that boats unloaded under electric working hoists, or similar conditions, that they be swung slowly on a port and starboard helm as soon as they get outside where there is room or before the vessel is put on her course. The loss of time will only be a few minutes, which, in many cases will be saved at the end of the course in being able to fetch right. It often occurs in the spring of the year that boats have to wait a week or so before getting started, owing to ice conditions, etc. When it can be done (and even if you have to go to some trouble in doing so) lay your boat at a dock or elsewhere, so that her head will lie in a reversed direction from that in which it lay during the winter. If you cannot get a dock that runs exactly with what is required, get one as near to reverse as possible. Where the boat can be reversed at her own winter moorings all the better. There is more advantage to this than many may realize and to those masters who take but very little stock in such matters, the writer wishes to inform them that no harm whatever, even if no good, can result in the practice of any of the foregoing recommendations. There is a great deal more that can be said about this matter but I will leave it till another time.—LONG.

AMONG OUR NAUTICAL VISITORS.

Capt. John Tower, of the steamer Frank T. Heffelfinger, was in Cleveland on Tuesday while his craft was discharging her ore cargo at Lorain. The MARINE REVIEW acknowledges a pleasant call from the genial skipper. Capt. Tower is a thorough sailor, both in the square-rigger and in steam, having sailed to all parts of the world. There are few men who hold a master's license for all the known waters of the world, including our fresh water seas, but this is what Capt. Tower possesses. Capt. Tower sailed one of the Counselman steamers from Chicago across the pond to Liverpool and up the North sea to Antwerp. After returning to the Atlantic coast his steamer engaged in the oil trade and the captain did most of the piloting in and out of the ports sailed to along that coast. In speaking of the ill-fated Cyprus, Capt. Tower incidentally mentioned that he was in company with her coming down the lake but got a long ways ahead between Keweenaw Pt. and Whitefish. Capt. Tower says that a very heavy sea was running and at times his boat did some wicked rolling, and had it not been for the way his ore was stowed he is sure it would have shifted. He said that the newspaper accounts that there was not much wind and sea it not true; the storm did not cover much area and was a slow-moving one, for they seemed to remain in about the center of it all the way across the lake. The storm was a heavy one and because it did not cover much territory is the reason that other near-by places did not experience the full force of it. Capt. Tower says that he has noticed sev-

eral times now that there is always more sea in the vicinity of where the Cyprus was lost than at any other place on the route with the same conditions, and he thinks that it may possibly be due to some peculiarity of the bottom, such as a ridge or wall of rock rising therefrom, notwithstanding the fact that there is no wave effect at certain depths below the surface. What there may be in this theory could only be told after a lengthy scientific investigation.

Capt. John M. Fields, the expert compass adjuster, was among our marine visitors on Saturday, having come in off the lake. Capt. Fields has had an exceptionally good season of it, the best since he came to the lakes from the Pacific coast. He was on eighty-nine different boats so far this season and has four more new ones to "fix up." So busy was Capt. Fields that it was necessary for him to have a power launch and a man to operate it so that he could get from one boat to another without losing time, this plan being cheaper and more satisfactory than traveling by rail. Capt. Fields would meet a steamer in his launch in the rivers, and he and his man taken on board and also the launch. The outfit would stay with the ship till a favorable time came for adjusting the compass, after which they were set afloat and picked up by another, and so on. For eight straight days the launch was carried back and forth between Port Huron and Detour. On another occasion the launch was taken as far as Whitefish Pt. This is certainly a novel method of covering the necessary territory and meeting the boats advantageously, little time being lost in either waiting or in missing them. Capt. Fields expects to conduct the several navigation schools for the Pittsburg Steamship Co. again this winter. These free schools are a source of much valuable and beneficial information, and the Pittsburg Steamship Co. is to be highly commended for its generosity and the interest taken in its men. The thanks are due to its president and general manager, H. Coulby. This is simply a case of sound judgment and farsightedness on his part, from which other steamship owners and managers might learn a valuable and profitable lesson by imitating. For the answer the MARINE REVIEW takes the following pertinent saying from a lake master in the harness: "This is an age of progress and improvement in all lines, we must all realize this, so that anything that increases a man's confidence in himself and his work increases his efficiency. He is not only worth more to himself but to his employer." Let the good work go on.

OUR COURSE AND BEARING CORRECTOR.

The MARINE REVIEW desires to announce that its Course and Bearing Corrector or Indicator is now ready for marketing, and that all orders for same will receive prompt attention. The Corrector is the very best device of its kind on the market and every seaman will find it to his advantage to have one of these instruments.

The Corrector consists of three pieces of thick cardboard, two circular and one square; the graduation on each being nicely printed from accurate plates; the cards are placed one on top of the other—the upper one being printed in green, 5 in. in diameter; the middle one in red, 8 in. in diameter; and the lower black, 11 in. in diameter, or on a cardboard 14 in. square. The lower card is the stationary card and the other two revolve from its center, and can be moved independently of each other. The three cards are printed on a white background, and the stationary or black compass represents true courses and bearings, the red card is the variation compass and from it correct magnetic courses and bearings are read; the green card represents the deviation compass and from it compass courses and bearings are read. A radial arm of celluloid revolves from the same center as the cards and its radius is long enough to sweep the three cards. The compass cards and radial arm can be set to any desired course and independently of one another.

The device is for working and proving all compass problems mechanically and a picture of the example itself. Its use affords the only method that is capable of proving this portion of a navigator's work. The device is as necessary and as useful to the navigator as it is to the beginner, and one can learn more about variation and deviation, the correcting of courses and bearings, and the naming of the variation and deviation, than by all the other methods put together, and in one-quarter of the time. This instrument is to the navigator what the adding machine is to a commercial house. One cannot make a mistake because every detail of the problem is constantly before him in the form of a picture. To work the device simply turn the red and the green cards (variation and deviation compasses) so that their norths coincide with north on the black card (true compass); in other words, have all three norths in the same straight line. Next set the amount of your variation on the red card, by turning its north to the right of true north for Ely Var. by its amount in degrees or quarter points, and to the left for Wly Var. Next place the green card in the direction and by the amount of the deviation, its north to the right of north on red card for Ely and to the left of it for Wly; then any one of the three courses or bearings—the true, the correct magnetic, or the compass course—being given, revolve the radial arm until its straight edge is upon that course, when the other two are seen on the same edge. If it is the true course that is desired simply set the radial arm to that course on the outside compass, then the red card will show the correct magnetic course that corresponds to it and the green card the compass course corresponding therewith. If you have the compass course or bearing and want to turn it into its true course or bearing, simply set radial arm to that point on the green card and then read outward, either on the red or black card, depending whether you want its correct magnetic or its true course or bearing. This is simply one of the many uses the device can be put to. The compass cards are of the very latest pattern and are well defined, and the course can be read both in quarter points and degrees. No live navigator can afford to be without one of these cheap but useful devices, and especially for the beginner or one who is anxious to learn all about variation and deviation and the conversion of courses. It will also be found very helpful for one learning the compass for all the points have their names inscribed on them, instead of only the cardinal and intercardinal points, as on the ordinary compass. The Corrector is especially recommended for nautical school work and every student should have one of them. In the next issue of the MARINE REVIEW the Corrector will be more fully explained and with illustrated examples. The price of the Corrector is $1.50. Send in your order at once.

The Servia, a bark rigged vessel engaged in the salmon trade, was wrecked on Nov. 6 off Julia Point, Carluk Harbor. The Servia was owned by the Charles Nelson Lumber Co. of San Francisco.

THE THEORY AND PRACTICE OF LAKE NAVIGATION

BY CLARENCE E. LONG

OFF-SHORE DISTANCE FINDING.

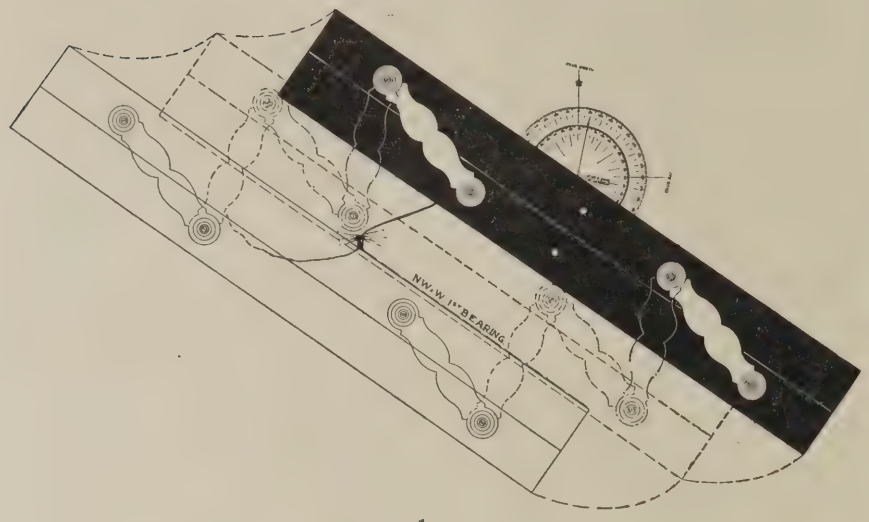


FIG. 1.

The following method of two bearings of the same object for ascertaining a ship's position at the time of the second bearing, is not only an accurate one but a very convenient one as well. Take the bearing by compass of an object, say A; turn it into its true bearing by allowing the deviation according to the correct magnetic course being steered and using that variation found on the chart for the ship's locality. Draw this converted bearing line on the chart through the object used for the bearing; it is needless to say that the ship will be somewhere on that line of bearing, but how far is the purpose of the method to determine. Next, after the ship has run a sufficient distance to make a good, broad angle, take another compass bearing of A, turn it into its true bearing and draw another line from A on that bearing; the ship is now some place on this line. Now, convert the compass course steered into its equivalent true course; put the distance run between bearings—on your dividers, lay your parallel rulers on the chart compass according to the true course steered, and then move them backwards or forward over the lines of bearings drawn till the distance on your dividers measures the distance between the two bearings along the edge of the rulers, and draw a line; where the line representing the course intersects with the line drawn to represent the second bearing, is the place of the ship at second bearing, and where the course intersected with the first bearing was the place of the ship at first bearing. Measure the distance from the ship's position to the object on shore along the second line of bearing, and you have it. The same thing may be done with the first bearing if found necessary for any purpose.

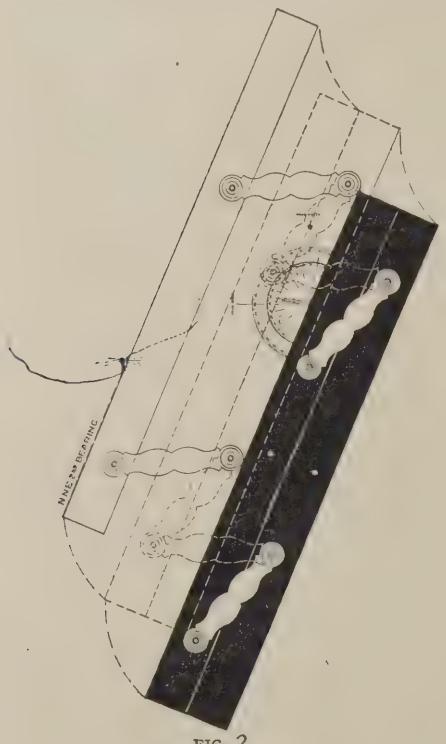


FIG. 2.

An example, graphically illustrated, will explain just what is meant: Compass course W ¼ S, Dev. 1-pt. Wly., Var. ¼-pt. Ely., steaming 12 miles an hour, at 9 a. m., a lighthouse bore NW ¼ W by compass and at 9:35 a. m. the same object bore NNE ¾ E. Required ship's position on the chart and the distance and true direction from the object at second bearing; also the same thing at first bearing.

The first thing to do is to find the total correction of the compass, that is, the Var. and Dev. combined. The deviation you will find from ship's deviation table and the variation from the chart according to the locality. In the above example the total correction is ¾-pt. Wly., the Dev. being 1-pt. Wly. and the Var. ¼-pt. Ely.; hence, the true course being steered is ¾-pt. to the left of the compass course, and ¾-pt. to the left of W ¼ S is W x S. The same thing is true of the compass bearings, ¾-pt. to the left of each bearing gives the true bearing; or worked out in full it would stand as shown on accompanying page.

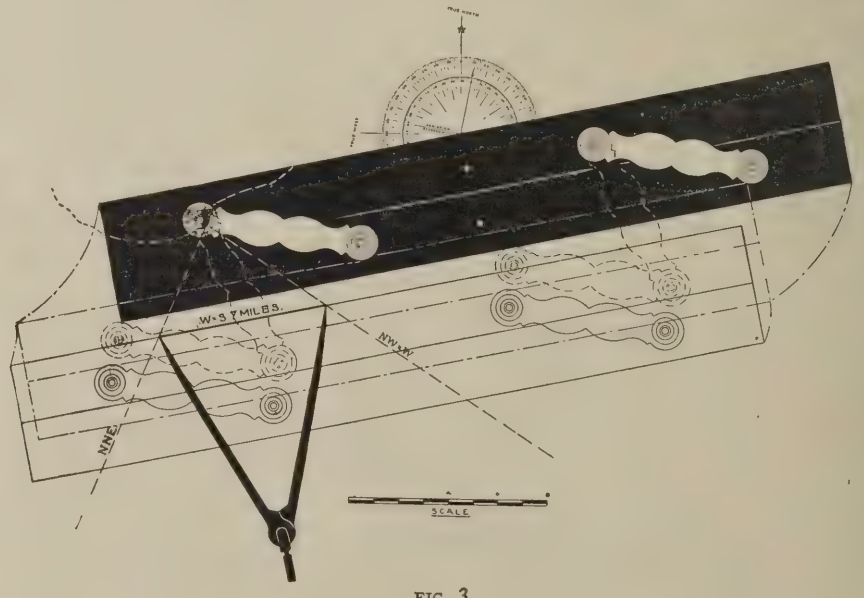


FIG. 3.

FIRST OPERATION.

Operation necessary in the first case—lay parallel ruler on chart compass so that it coincides with NW x W and SE x E and then work the ruler down over the lighthouse in question and when directly over it draw a pencil line, drawing it much longer than is required.

SECOND OPERATION.

Lay parallel ruler on chart compass so that it coincides with NNE and SSW and

then work it down, keeping it perfectly parallel, till its edge lies directly over the lighthouse indicated on the chart, and draw a pencil line as before. You now have the two converted compass bearing lines drawn on the chart just as they were actually taken.

THIRD OPERATION.

Lay parallel rulers on chart compass corresponding to the true course of W x S and work the ruler down over the bearing lines drawn and where the span of the dividers touches each bearing line at the same time is the actual course the ship has made on the chart, and which also shows the position of the ship at the time the bearings were taken.

The distance ran between bearings in the above example was 7 miles, it taking 35 minutes at 12 miles an hour to cover the distance between the times of the two bearings.

This bearing is sometimes called a scalene triangle bearing, because its shape is always that of the scalene triangle, and that is, a triangle whose sides and angles are all unequal.

SHOWING THE BEARING COMPLETED.

The simplest way of finding a ship's position by means of compass bearings is by doubling the bow angle, because in that case the run is the distance from the object at the time of taking the second bearing. This latter method simply gives you the distance you are from the object, but not its true bearing, so that if this be required the second bearing by compass must be turned into its true bearing and the line drawn on the chart accordingly. For example, the compass course is west, first bearing is WNW (3 points from course) and second bearing is NW x N, or six points from course. The ship between the times of taking the two bearings has run 6 miles, consequently the ship is 6 miles from the object, whose compass bearing is NW x N. Now, if the compass has both variation and deviation, the bearing line NW x N could not be put on the chart as a true bearing, it would first need conversion. A handy way of doing this is to simply convert the second bearing into its true bearing by applying the variation and deviation to the compass bearing; then to draw this line on the chart over the object and measure off the distance as found by running between the two bearings. Where it is unnecessary to lay off the ship's exact position on the chart the variation and deviation do not enter the problem, the compass being simply used to measure the angles by and from which the distance is determined by knowing the distance run and the angles between it. But where it is necessary to get the ship's true position on the chart the variation and deviation must first be allowed to the compass bearings. Many books and writers do not make this point strong enough, and by reason of it there are many who seem to have an idea that no allowance is to be made.

Compass Course	W ¼ S = 7¾	pts. R. of S.
Deviation Wly.	1	pts. L.
Correct Magnetic Course	6¾	pts. R. of S.
Variation Ely.	¼	pts. R.
True Bearing	7	pts. R. of S. = W x S.

	First Bearing.	Second Bearing.
Compass Bearing	NW ¼ W	NNE ¾ E
Deviation Wly.	1-pt.	1-pt.
Correct Magnetic Bearing	NW x W ¼ W	N x E ¾ E
Variation Ely.	¼-pt.	¼-pt.
True Bearing	NW x W	NNE

HIGH LEVEL BRIDGES IN CLEVELAND.

(Continued from page 21.)

ance that a three per cent, or even less, grade could safely be figured on.

Mr. Goulder said that on the modern freighter the smokestack is usually 77 ft. above the keel, that the most reliable lights a steamer is guided by are the range lights, and to get a range there must be after lights. The forward light is by law carried 40 ft. above the spar deck and the after light 15 ft. above the forward light.

Harry Coulby called attention to the fact that the forward spar would actually be higher than the after spar when the boat was in a light condition. He did not think it possible to lower the spars any as the forward spar does not reach much above the top of the pilot house now.

The suggestion of telescopic spars was discussed, but was not favored by vessel owners. W. J. Springborn, director of public works, was rather impressed with the idea of a telescopic spar, holding that the lights were not needed while the vessel was in harbor. He thought the quickest way to solve the whole problem was to lower the masts and even suggested that the city would pay vessel owners a certain sum per annum for the labor of raising and lowering them while passing under the viaducts.

Mr. Goulder said that the vessel owners had first of all considered that 110 ft. clearance was needful, but had amended it to 100 ft. He now thought that if 92 or 93 ft. clearance could be secured that vessel owners would be content with a fixed structure and would bear any expense necessary to accommodate the spars of their vessels to it.

In answer to a direct question Mr. Springborn said that he understood that the Erie and Nickel Plate railways intended to eliminate the center piers on the bridges that they are now replacing, and that the administration is pledged to the removal of every center pier from the river, not alone for the interests of navigation but for general protection to the flats in time of freshets. He also stated in answer to a question that he was perfectly willing to issue an order placing the operation of bridges under the direction of the harbormaster. Mr. Goulder thought that the harbormaster should have direct charge of the movement of ships and the operation of bridges.

Mr. Coulby thought 92 ft. to be the least clearance that vesselmen could get along with. He was also of opinion that a four per cent grade was utterly impracticable and that if the viaduct was constructed with a four per cent grade across the river a dozen teams would be found with broken legs at the bottom of the grade every morning. He did not think that for many years any of the ships over 28 ft. molded depth would go above the viaduct.

Regarding the passenger lines T. F. Newman, general manager of the Cleveland & Buffalo line, stated that he thought they could get down to 90 ft. readily.

The committee adopted a resolution, proposed by Capt. John Mitchell and seconded by Mr. Coulby, recommending that the fixed structures across the river have a clearance of not less than 93 ft.

BIDS FOR NAVAL SUPPLIES.

Bids received at the bureau of supplies, navy department, Washington, D. C., under a special call and opening, opened Nov. 7, included the following:

Class 31—Pensacola—Brass Globe and Angle Valves.

American Supply Co., Mobile, Ala...$ 829.80
Buckeye Iron & Brass Works, Dayton, O. 833.52
Central Metal & Supply Co., 609 E. Lombard St., Baltimore, Md..... 748.80
Cuyler & Mohler, 611 William St., Baltimore, Md. 747.72
Fairbanks Co., New Orleans, La.... 957.12
Hartman Co., 1231 N. Front St., Philadelphia, Pa. 753.96
Handlan-Buck Mfg. Co., St. Louis, Mo. 753.96
Knox & Bro., 96 John St., New York 754.04
E. F. Keating Co., 452 Water St., New York 760.68
Lunkenheimer Co., Cincinnati, O.... 815.04
Manhattan Supply Co., 127 Franklin St., New York 693.48
Manning, Maxwell & Moore, 85 Liberty St., New York 771.87
Motley, Green & Co., 66 Broad St., New York 732.12
Nelson Valve Co., Windmoor, Pa... 664.80
William Powell Co., Cincinnati, O.. 801.48
Charles E. Robidoux, St. Louis, Mo.. 1,047.72

Class 32—Pensacola—Brass Tees, Elbows, Unions, Bushings and Plugs.

American Supply Co., Mobile, Ala.....$470.28
Crane Co., 519 So. Canal St., Chicago, Ill. 404.80
Central Metal & Supply Co., 609 E. Lombard St., Baltimore, Md..... 473.90
E. F. Keating Co., 452 Water St., New York 933.47
Manhattan Supply Co., 127 Franklin St., New York $418.09 723.03
A. B. Sands & Sons Co., 22 Vesey St., New York 449.88

Class 75—Brooklyn—20 Binnacles.

Keuffel & Esser, Hoboken, N. J.....$2,900
E. S. Ritchie & Sons, Brookline, Mass.. 3,038

Class 76—Brooklyn—30 Peloruses.

Keuffel & Esser, Hoboken, N. J.....$3,240
E. S. Ritchie & Sons, Brookline, Mass.. 2,970

Class 91—Norfolk—3,800 ft. Tiller Rope and Hoisting Rope.

Berry & Aikens, Thirty-sixth and Wharton Sts., Philadelphia, Pa.....$ 879.34
Manhattan Supply Co., 127 Franklin St., New York 783.82
New Jersey Foundry & Machine Co., 9 Murray St., New York..... 769.20
Vermilye & Power, 17 Battery Place, New York 720.00
Fairbanks Co., Baltimore, Md..... 1,234.00
J. M. Umstadter, Norfolk, Va..... 828.00

Class 92—Norfolk—14 Duplex Chain Blocks.

F. S. Banks & Co., 73 Warren St., New York $317.46
William W. Clark & Son, 546 Monument St., Baltimore, Md..... 408.00
Trevert Machinery Co., 18 Dey St., New York 336.00
Handlan-Buck Mfg. Co., St. Louis, Mo. 408.00
Knox & Bro., 96 John St., New York. 408.00
J. B. Kendall, Washington, D. C..... 336.90
Manhattan Supply Co., 127 Franklin St., New York 362.52
Manning, Maxwell & Moore, 85 Liberty St., New York 408.00
Motley, Green & Co., 66 Broad St., New York 408.00
Montgomery & Co., 107 Fulton St., New York 408.00
New Jersey Foundry & Machine Co., 9 Murray St., New York..... 319.80
Sherman-Brown-Clements Co., 78 Murray St., New York 404.50
Vermilye & Power, 17 Battery Pl., New York 324.40
Fairbanks Co., Baltimore, Md..... 408.00
J. B. Roache, 350 Fulton St., Brooklyn, N. Y.....$366.56 408.00

Class 101—Norfolk—Four Sets Diving Apparatus.

Andrew J. Morse & Son, 221 High St., Boston, Mass $4,388
A. Schrader's Sons, 32 Rose St., New York 4,420

Class 102—League Island—Two Sets Diving Apparatus.

Andrew J. Morse & Son. 221 High St., Boston, Mass. $2,194
A. Schrader's Sons, 32 Rose St., New York 2,202

Class 111—Portsmouth—425 lbs. Square Packing.

Brooklyn Forge & Supply Co., Brooklyn, N. Y. $501.50
Crandall Packing Co., 136 Liberty St., New York 531.25
Double Service Packing Co., 430 Walnut St., Philadelphia, Pa..... 371.87
Garlock Packing Co., 136 Liberty St., New York 562.27
Hart Packing Co., 145 High St., Boston, Mass. 510.00
J. B. Roache, 350 Fulton St., Brooklyn, N. Y..... 956.25

Class 147—Fortsmouth—252 Valves.

Central Metal & Supply Co., 609 E. Lombard St., Baltimore, Md.....$669.60
Cuyler & Mohler, 611 William St., Baltimore, Md. 367.92
E. F. Keating Co., 452 Water St., New York 385.56
Lunkenheimer Co., Cincinnati, O..... 446.04
Charels E. Robidoux, St. Louis, Mo., (part) 354.00
Brauman-Dow Co., 239 Causeway St., Boston, Mass. 469.80

Class 155—Portsmouth—6 Sq. Yds. Gasket Gum.

S. R. Fletcher & Co., 26 Cortlandt St., New York $378.00
Gutta Percha & Rubber Mfg. Co., 126 Duane St., New York 204.00
Mallison & Grossman, 23 Warren St., New York 371.40
Diamond Rubber Co., 1846 Broadway, New York 328.98
E. F. Goodrich Co., 66 Reade St., New York 414.00
H. W. Johns-Manville Co., 100 William St., New York 482.40

Class 156—Portsmouth—139 Sq. Yds. Asbestos Packing.

O. A. Danzenbaker, Washington, D. C.$661.20
Double Service Packing Co., 430 Walnut St., Philadelphia, Pa..... 670.98
Ehret Magnesia Mfg. Co., Land Title Bldg., Philadelphia, Pa..... 716.30
E. F. Keating Co., 452 Water St., Philadelphia, Pa. 710.30
Manhattan Supply Co., 127 Franklin St., New York 733.20
New Jersey Asbestos Co., 52 Dey St., New York 1,027.75
Rider & Cotton, Portsmouth, N. H.... 674.70
H. W. Johns-Manville Co., 100 William St., New York 993.00

Class 161—Norfolk—Twelve Motor Dories.

Atlantic Co., Amesbury, Mass.....$6,108
American Supply Co., Mobile, Ala..... 5,880
Electric Launch Co., Bayonne, N. J.... 6,240
Motley, Green & Co., 66 Broad St., New York 4,800
Topham Boat Mfg. Co., Boston, Mass... 7,650
Vermilye & Power, 17 Battery Pl., New York 4,908
Gas Engine & Power Co. & Chas. L. Seabury, Morris Heights, N. Y..... 7,176
Lumley-Dodson Co., Norfolk, Va..... 5,400

CANAL CIRCULAR 397.

Bids received by the general purchasing officer of the Isthmian Canal Commission, for material and supplies, opened Nov. 8, included the following:

Class 1—Four Boiler Feed Pumps.

A. S. Cameron Steam Pump Works, foot of E. Twenty-third St. and East River, New York $324.00
M. T. Davidson Co., 154 Nassau St., New York 550.00
Fox Bros. & Co., 126 Lafayette St., New York $230.80 259.80
Gardner Governor Co., Quincy, Ill..... 212.00
A. D. Granger Co., 90 West St., New York 296.00
Manning, Maxwell & Moore, 85 Liberty St., New York 211.52
Motley, Green & Co., 66 Broad St., New York 236.00
National Electric Supply Co., Washington, D. C.....$231.00 407.40
Queen City Supply Co., Cincinnati, O.. 252.00
Reliance Machine & Tool Works, St. Louis, Mo. 276.00
Charles E. Robidoux, 1012 Chemical Bldg., St. Louis, Mo..... 252.00
Henry R. Worthington, 114 Liberty St., New York.....$204.76, $224,44, $538.20 ..... 989.76
F. S. Banks & Co., 73 Warren St., New York $225.00 410.00
Drew Machinery Agency, Manchester, N. H. 256.00

Class 2—Six Row Boats.

James Burcher, 852 Swanson St., Philadelphia, Pa. .....$ 974.00
Duplex Roller Bushing Co., Belfast, Me. 720.00
Fox Bros. & Co., 126 Lafayette St., New York 972.00
Gas Engine & Power Co. and Charles L. Seabury Co., Morris Heights, N. J. 2,250.00
David Kahnweiler's Sons, 2 Dover St., New York 1,500.00
Motley, Green & Co., 66 Broad St., New York 870.00
F. S. Banks & Co., 73 Warren St., New York 978.00

Class 3—Six Whale Boats.

Duplex Roller Bushing Co., Belfast, Me. $4,800.00
Fox Bros. Co., 126 Lafayette St., New York 3,210.00
Gas Engine & Power Co. and Charles L. Seabury Co., Morris Heights, N. J. 8,214.00
David Kahnweiler's Sons, 2 Dover St., New York 4,050.00
Motley, Green & Co., 66 Broad St., New York 3,555.00

CANAL CIRCULAR 398.

Bids received at the office of the general purchasing officer of the Isthmian Canal Commission for material and supplies, opened Nov. 12, included the following:

Class 9—41 Hoisting Chains.

F. S. Banks & Co., 73 Warren St., New York $3,146.00
Bigelow & Dowse Co., 229 Franklin St., Boston, Mass..... 3,237.00
Columbus Chain Co., Columbus, O... 2,518.60
Handlan-Buck Mfg. Co., St. Louis, Mo., per lb., $7.87, $8.10..... 8.48
Hayden-Corbett Chain Co., 250 Fulton St., New York 2,433.50
Lebanon Chain Works, Lebanon, Pa.. 2,953.10
Motley, Green & Co., 66 Broad St., New York 3,187.60
Newhall Chain Forge & Iron Co., 9 Murray St., New York..$2,694.10.. 3,130.00
Charles E. Robidoux, 1012 Chemical Bldg., St. Louis, Mo..... 2,782 00
S. G. Taylor Chain Co., 96 Indiana St., Chicago, Ill..... 2,851.00

Class 10—4,000 ft. Plow Steel Wire Cable.

Broderick & Bascom Rope Co., St. Louis, Mo. .....$ 960.00
Macomber-Whyte-Moon Co., 122 Center St., New York 1,448.00
John A. Roeblings Sons Co., 117 Liberty St., New York 1,413.60
U. S. Steel Products Export Co., 24 State St., New York..... 960.00

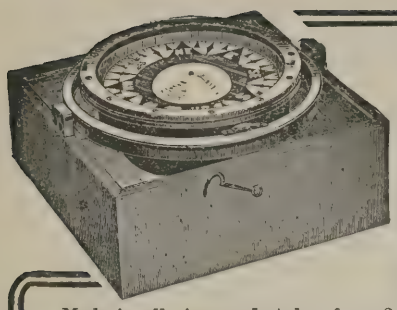
Class 11—5,700 ft. Unlined Linen Hose.

W. D. Allen Mfg. Co., 151 Lake St. Chicago, Ill. .....$ 739.05
Boston Woven Hose & Rubber Co., Cambridge, Mass. 787.50
James Boyd & Co., 14 North Fourth St., Philadelphia, Pa..... 797.43
Combination Ladder Co., 32 Park Pl., New York 808.87
Fox Bros. & Co., 127 Lafayette St., New York 690.00
Handlan-Buck Mfg. Co., St. Louis, Mo. 844.00
S. F. Hayward & Co., 20 Warren St., New York 954.30
E. F. Keating Co., 452 Water St., New York 867.00
Manning, Maxwell & Moore, 85 Liberty St., New York 746.10
Mineralized Rubber Co., 18 Cliff St., New York 771.00
Motley, Green & Co., 66 Broad St., New York 772.20
Revere Rubber Co. of New York, 59 Reade St., New York 874.50
William G. Stevenson, 110 Race St., Philadelphia, Pa. 844.50
H. J. M. Howard, Washington, D. C. 1,116.00
United & Globe Rubber Mfg. Cos., Trenton, N. J..... 948.00

The first test of briquettes as fuel by the navy department was made last week aboard the torpedo boat Biddle. One boiler burned briquettes and the other coal. It is stated that better steaming conditions were obtained than ordinarily and that a speed of 35 miles an hour was reached.

UNDERWRITERS SALVAGE SALE. S. S. "PICTON."

Pursuant to instructions received from the Underwriters, the undersigned will receive tenders for the purchase of the Steamer "Picton" damaged by fire, as she now lies at the Dock of the Richelieu and Ontario Navigation Company, Yonge St. Slip, Toronto, Ontario, up to 12 o'clock noon of Thursday, December 5th next, at his office, Corner Scott & Front Streets, Toronto. No tenders necessarily accepted. Tenders will be opened in the presence of the bidders at the time and place above mentioned. The Steamer can be inspected by intending purchasers on application to Mr. Edward Ramage, or to myself. W. G. A. Lambe, Lloyd's Agent, Corner Front & Scott Sts., Toronto.



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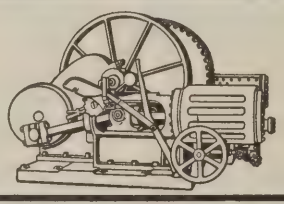
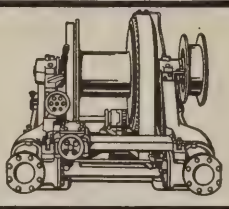
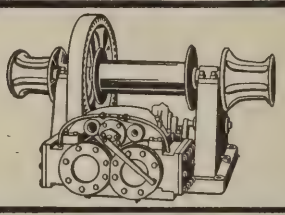

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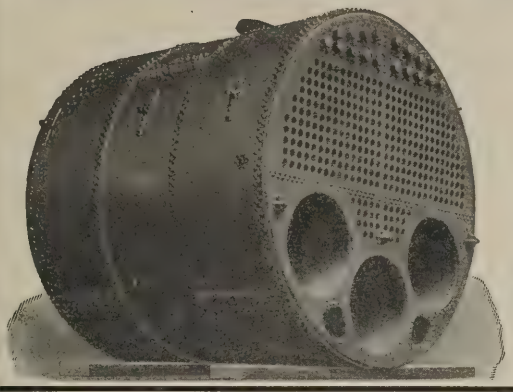

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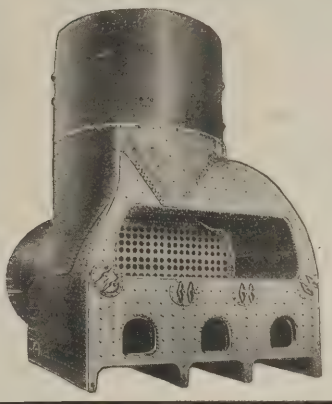

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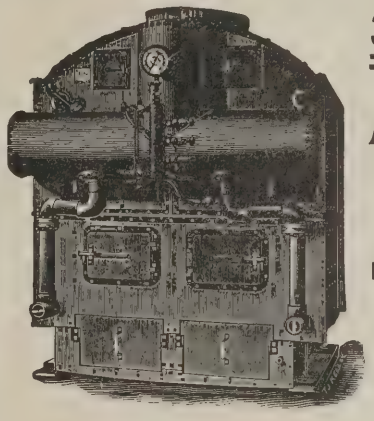

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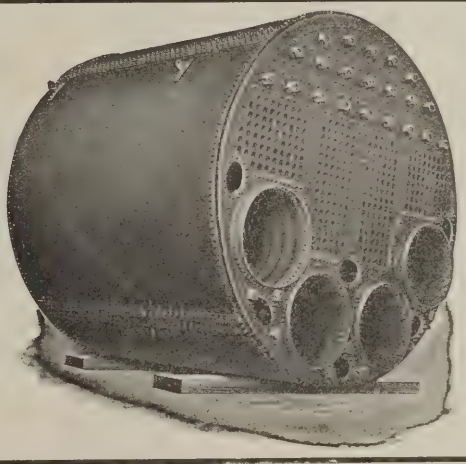

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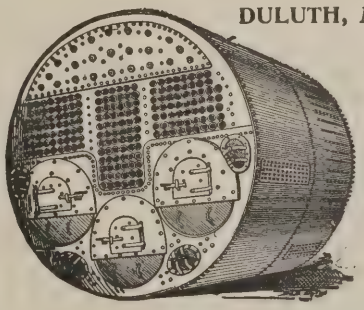

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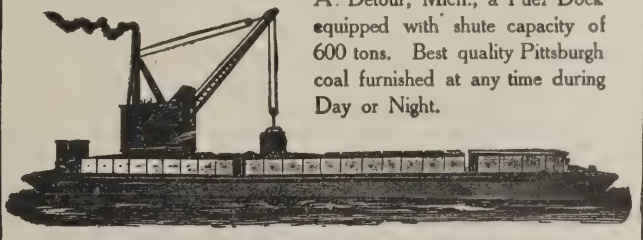

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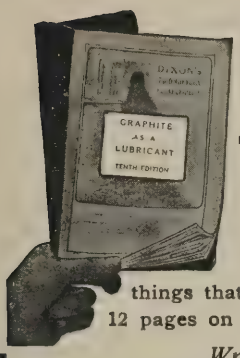

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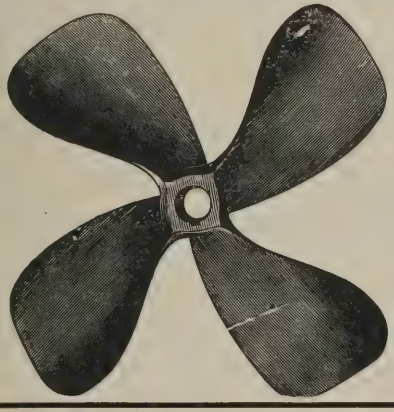

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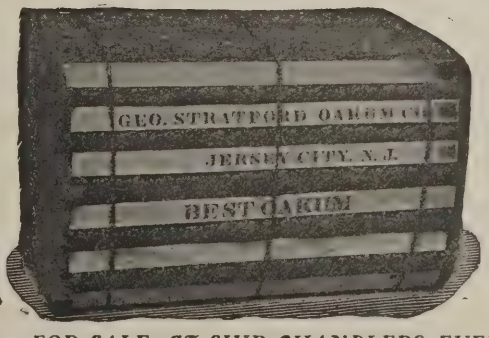

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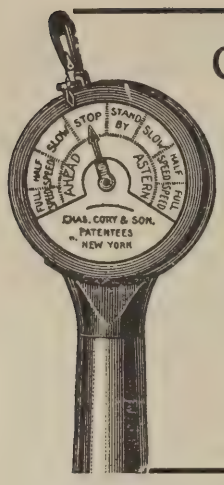

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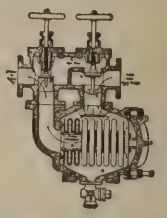

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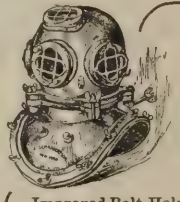

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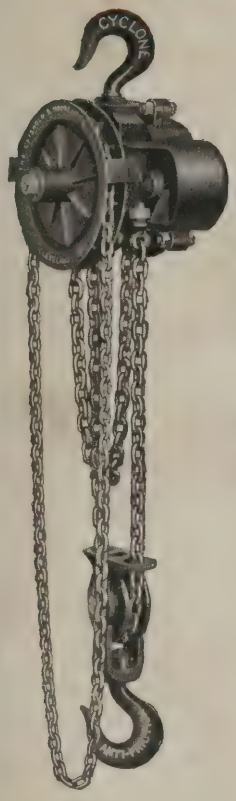

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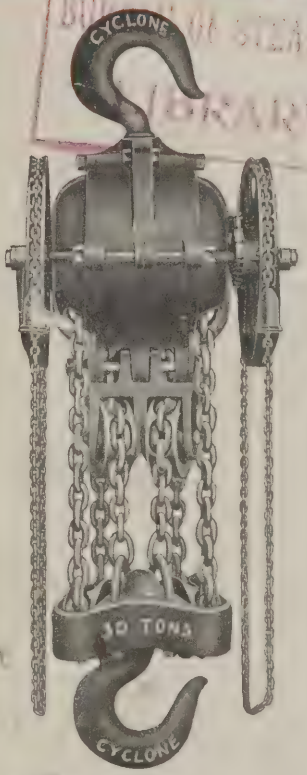

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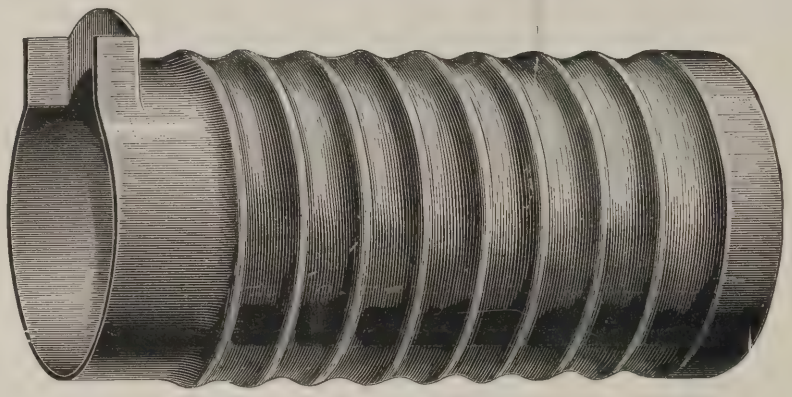

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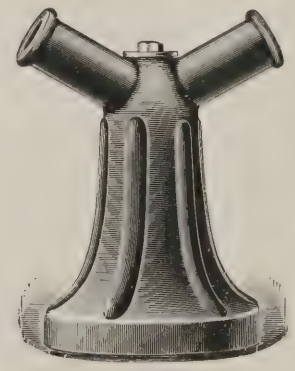

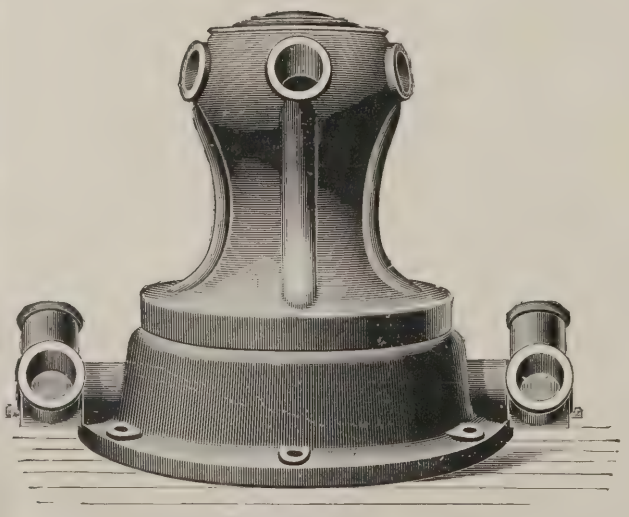

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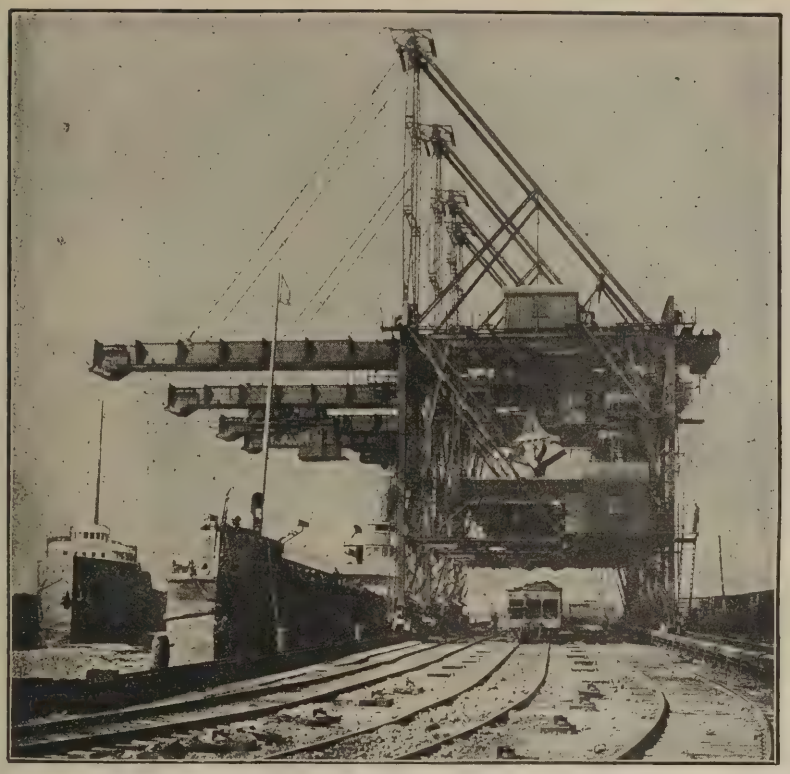

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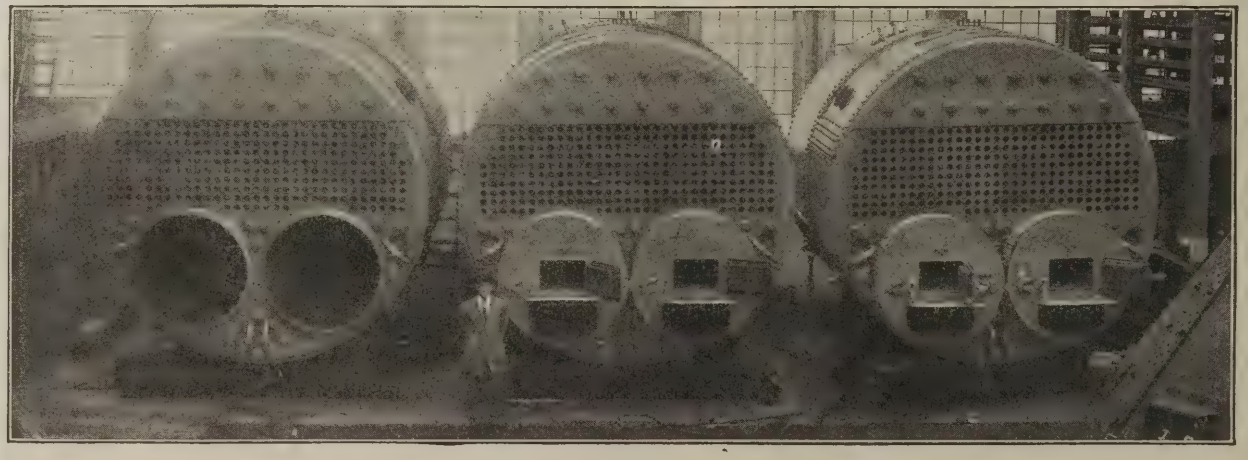

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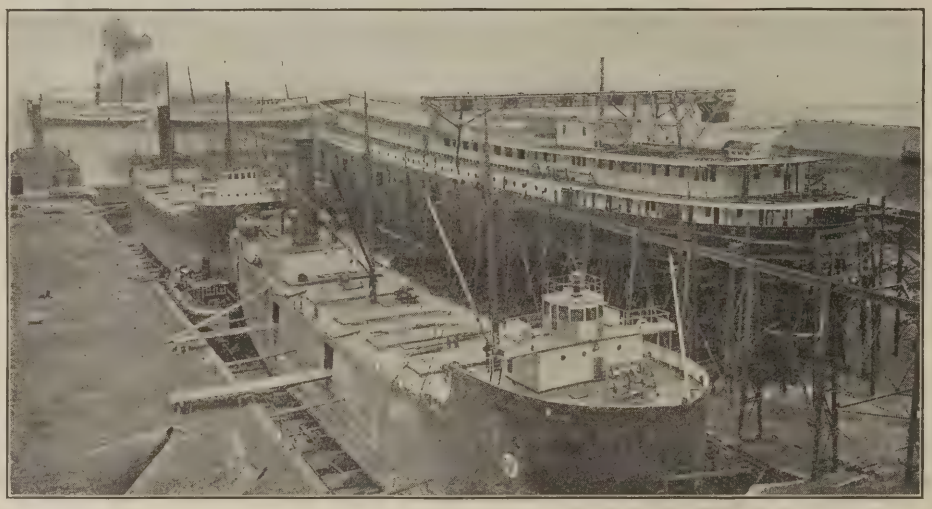

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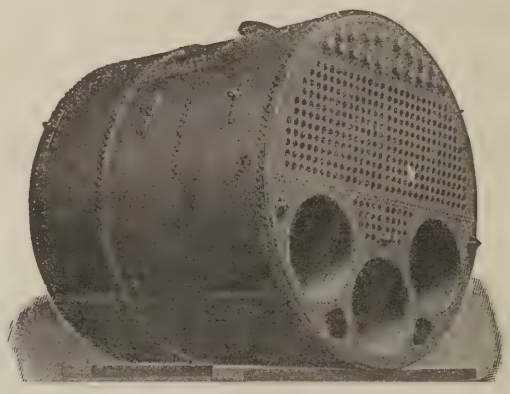

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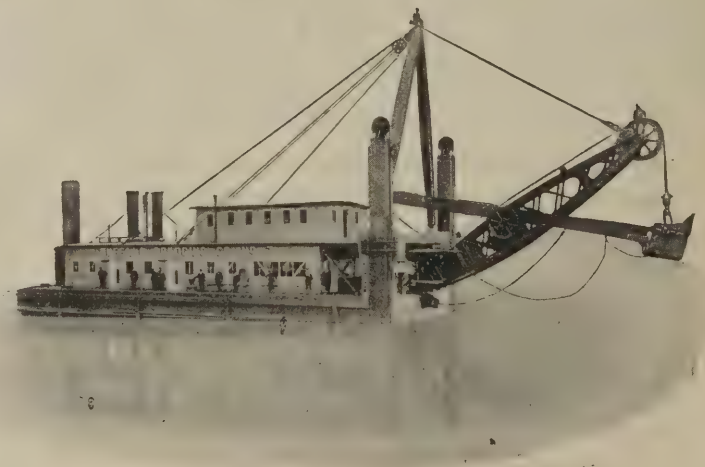

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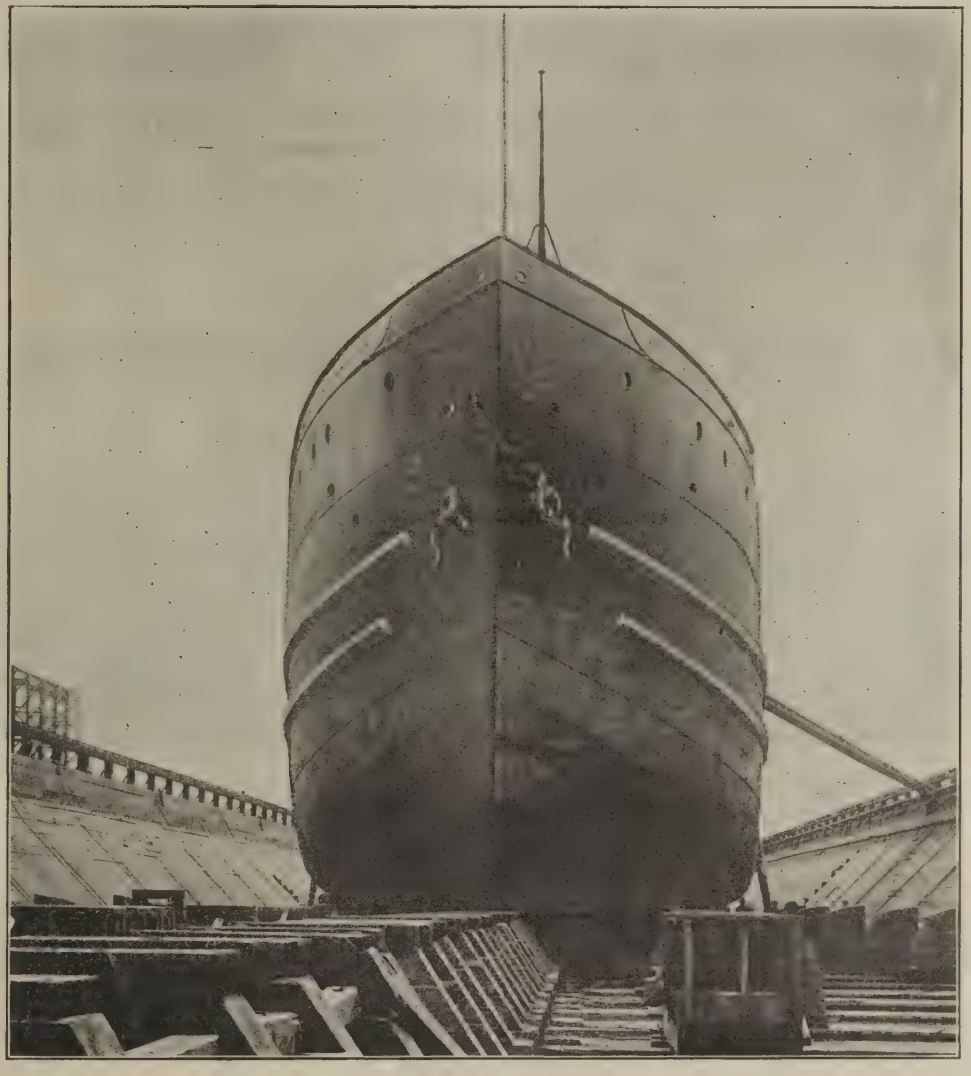

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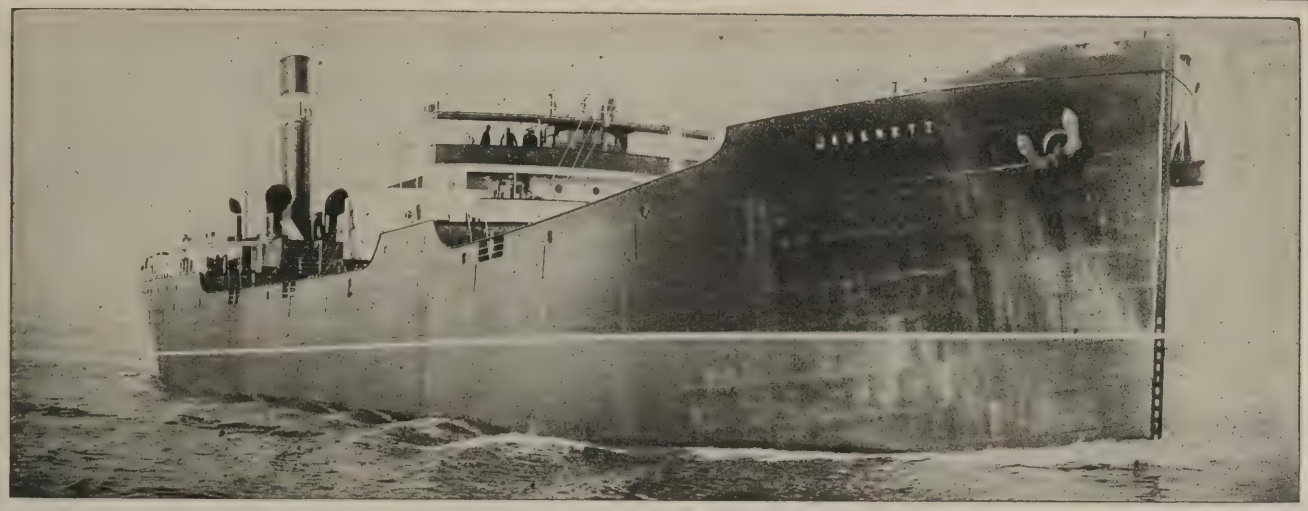

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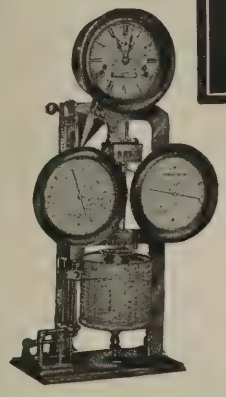

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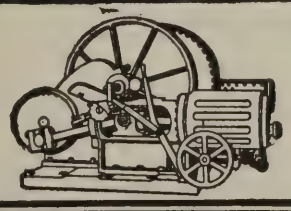
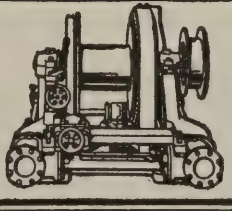
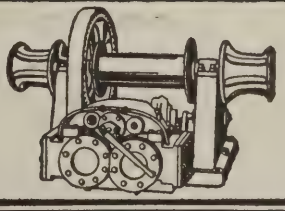

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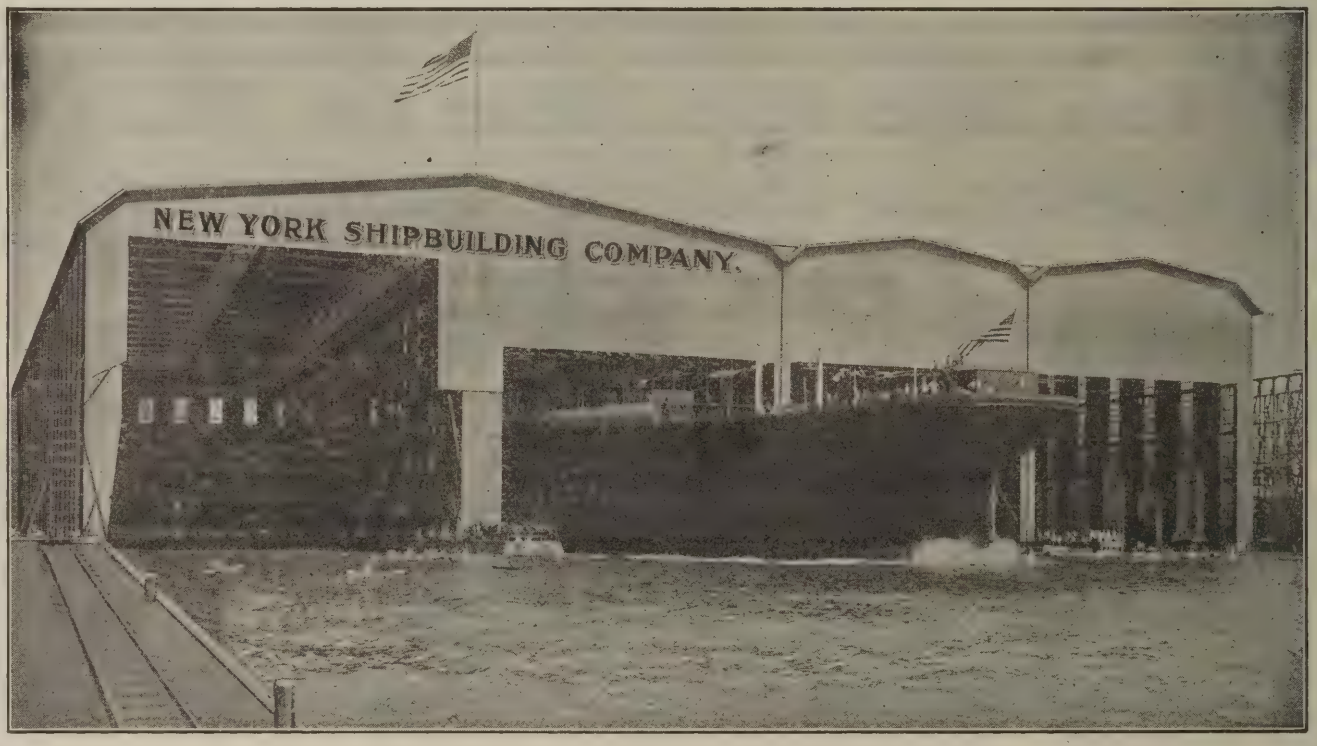

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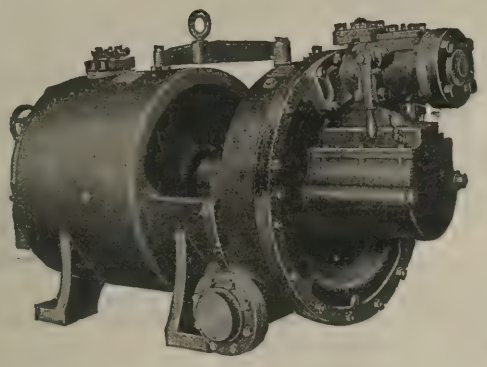

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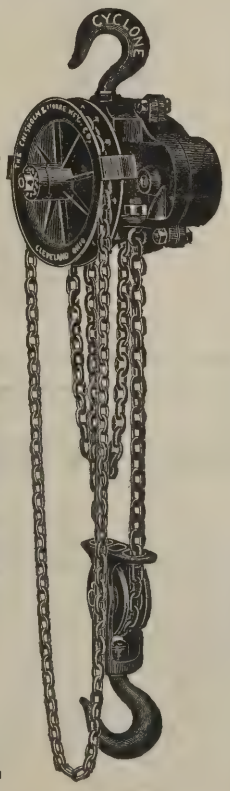

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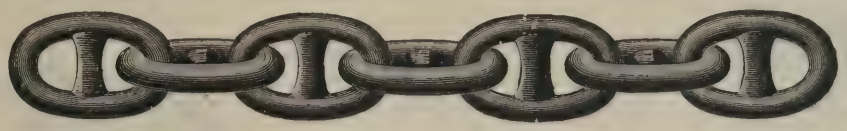

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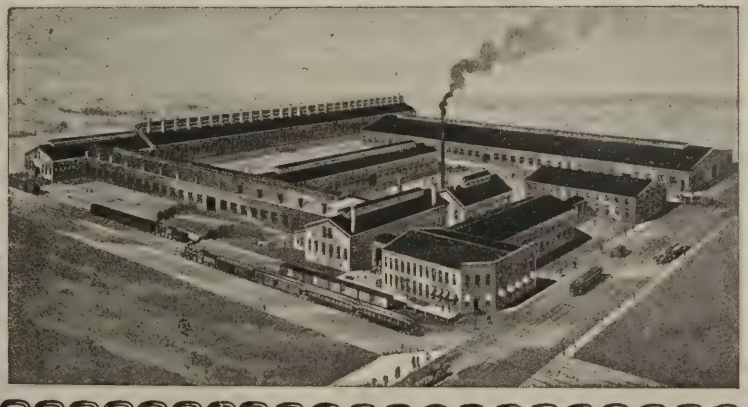

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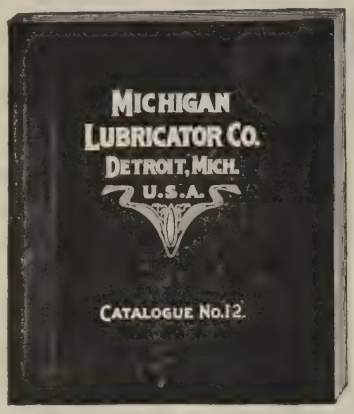

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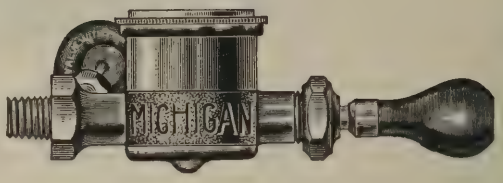

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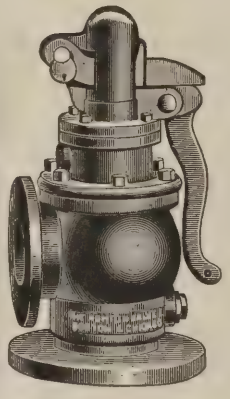

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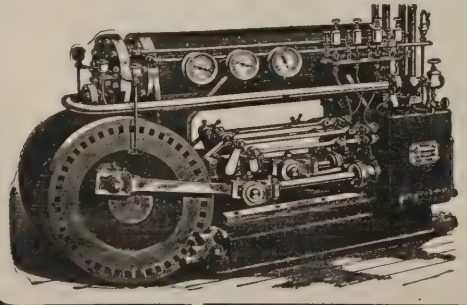

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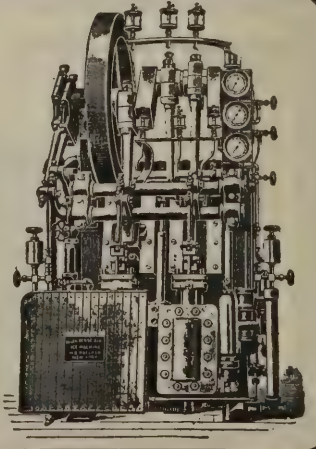

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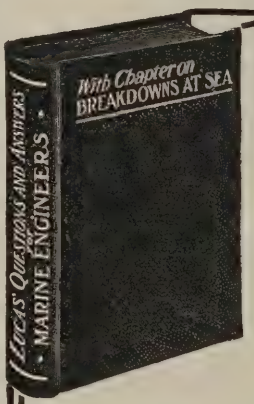

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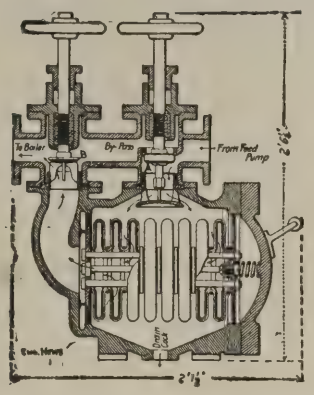

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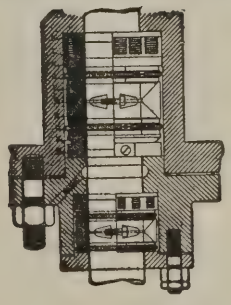

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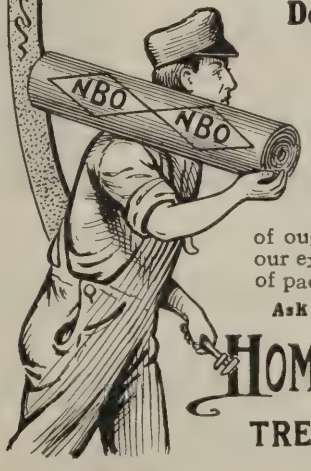

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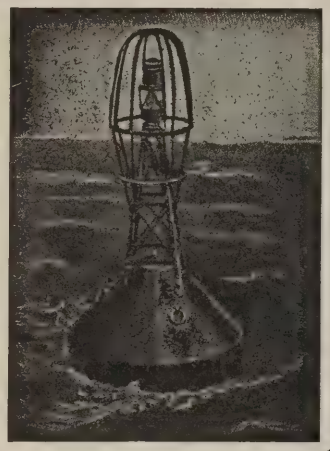

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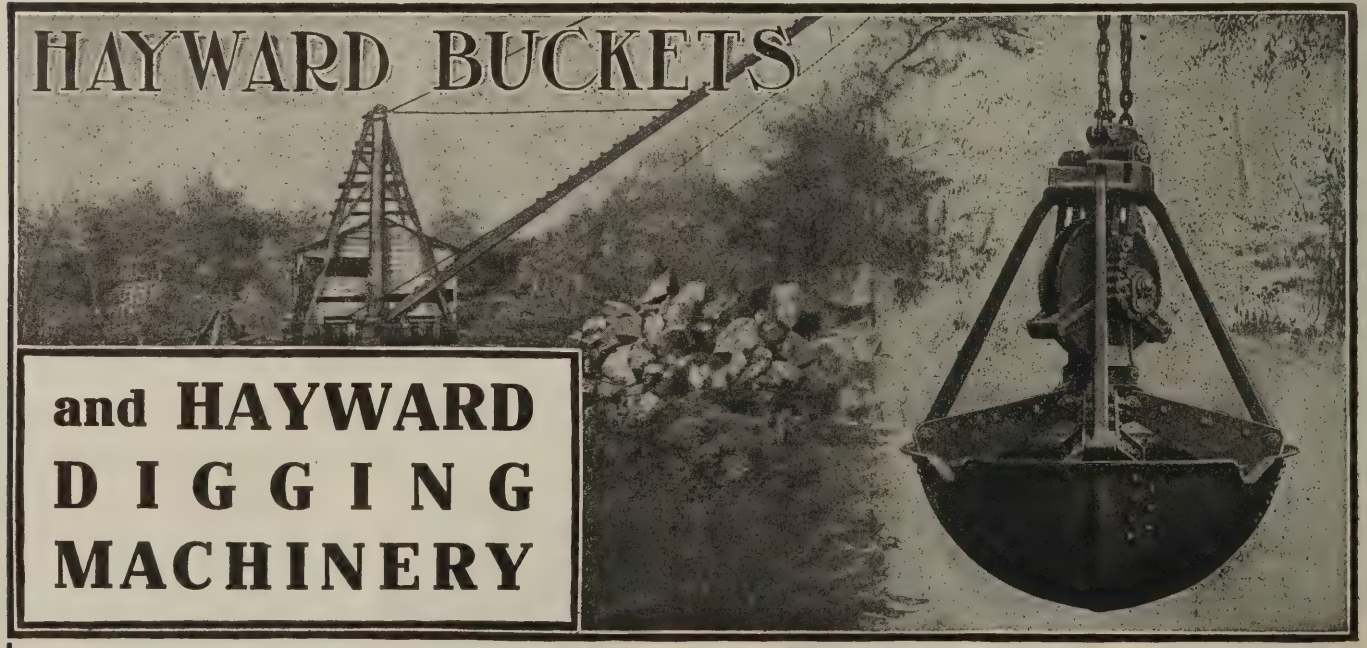

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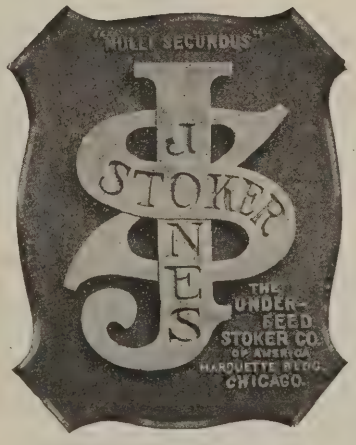

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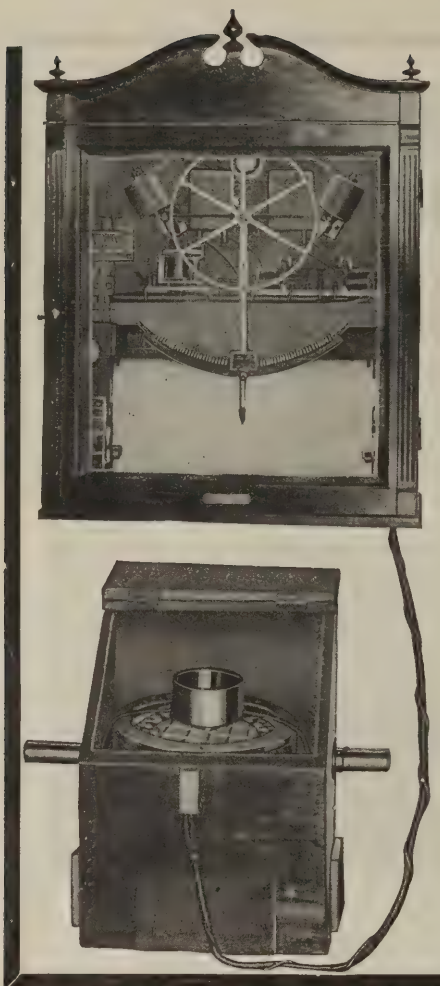

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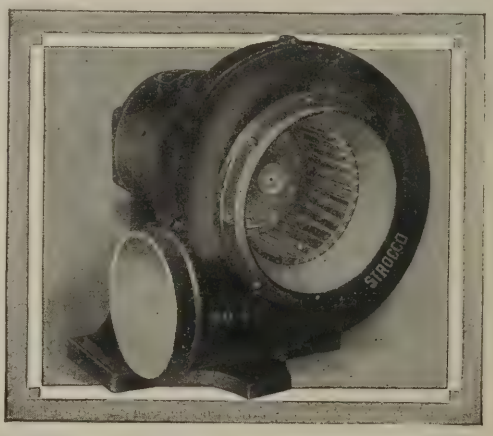

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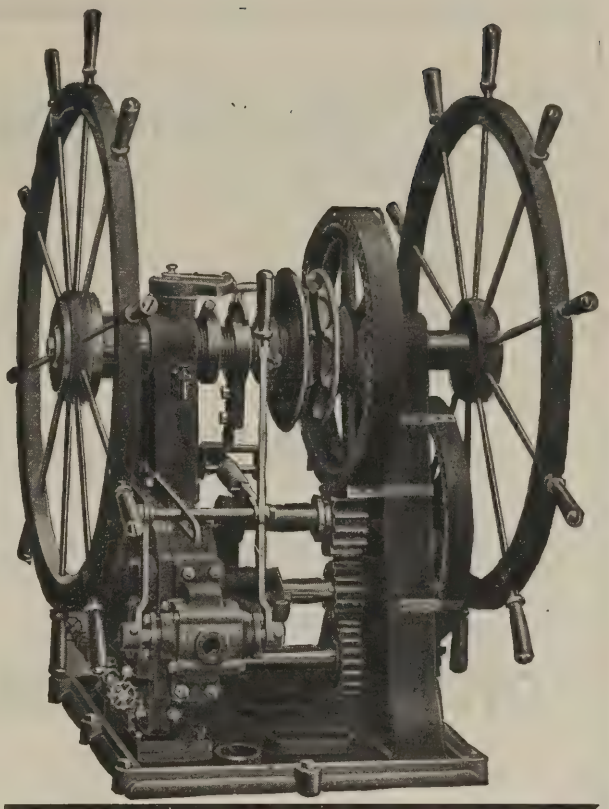

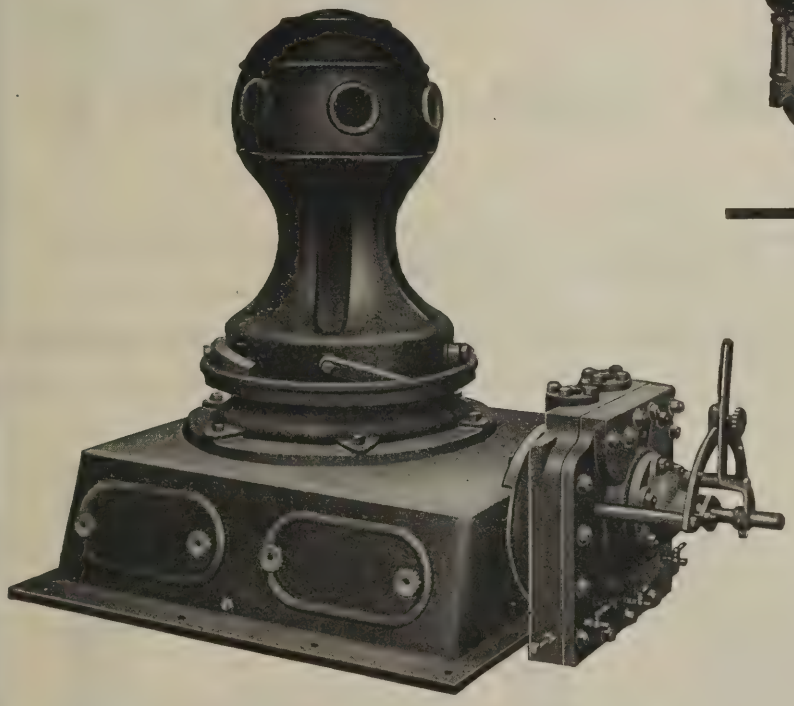

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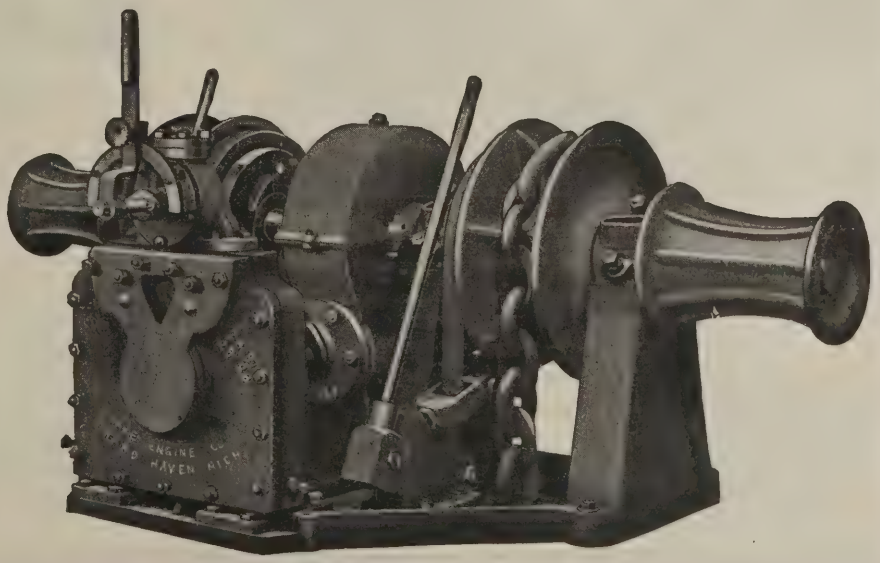

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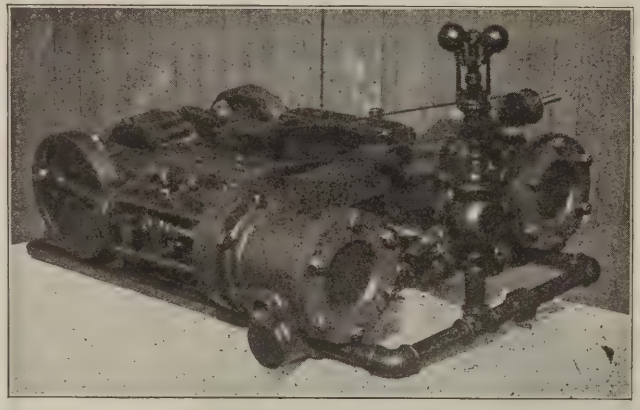

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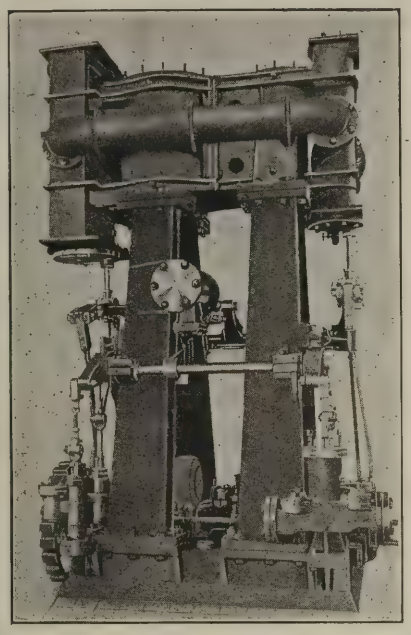

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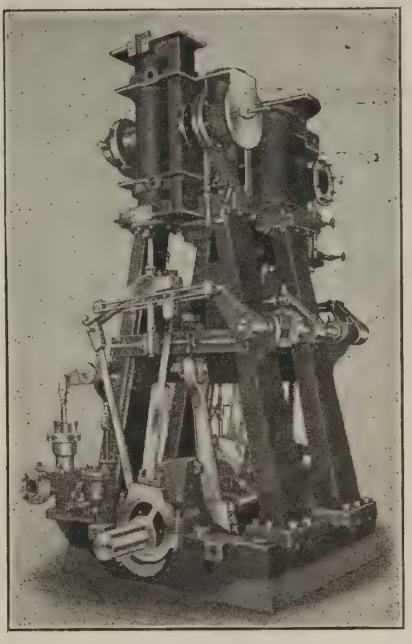

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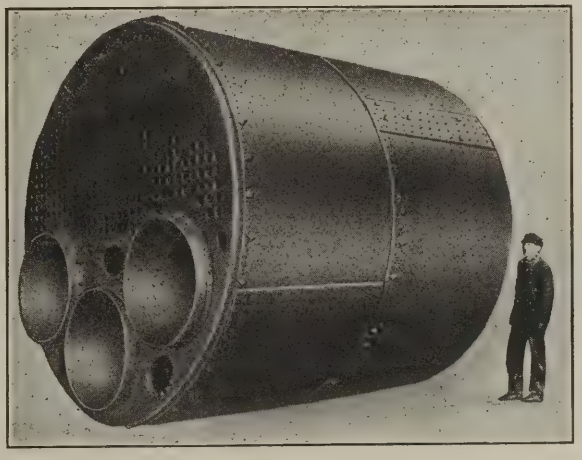

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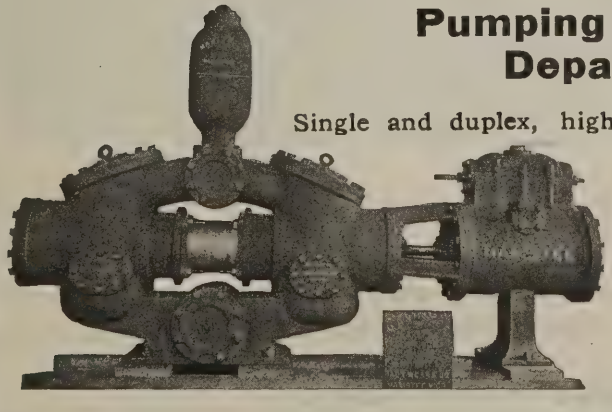

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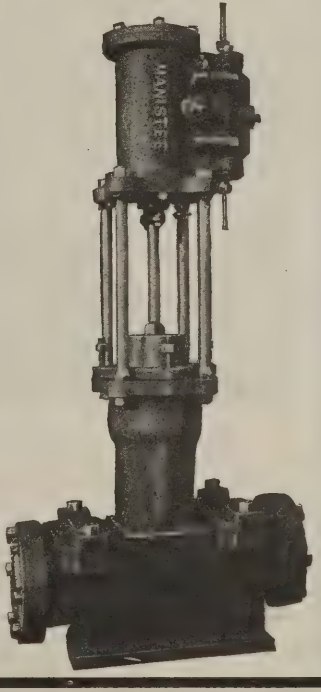

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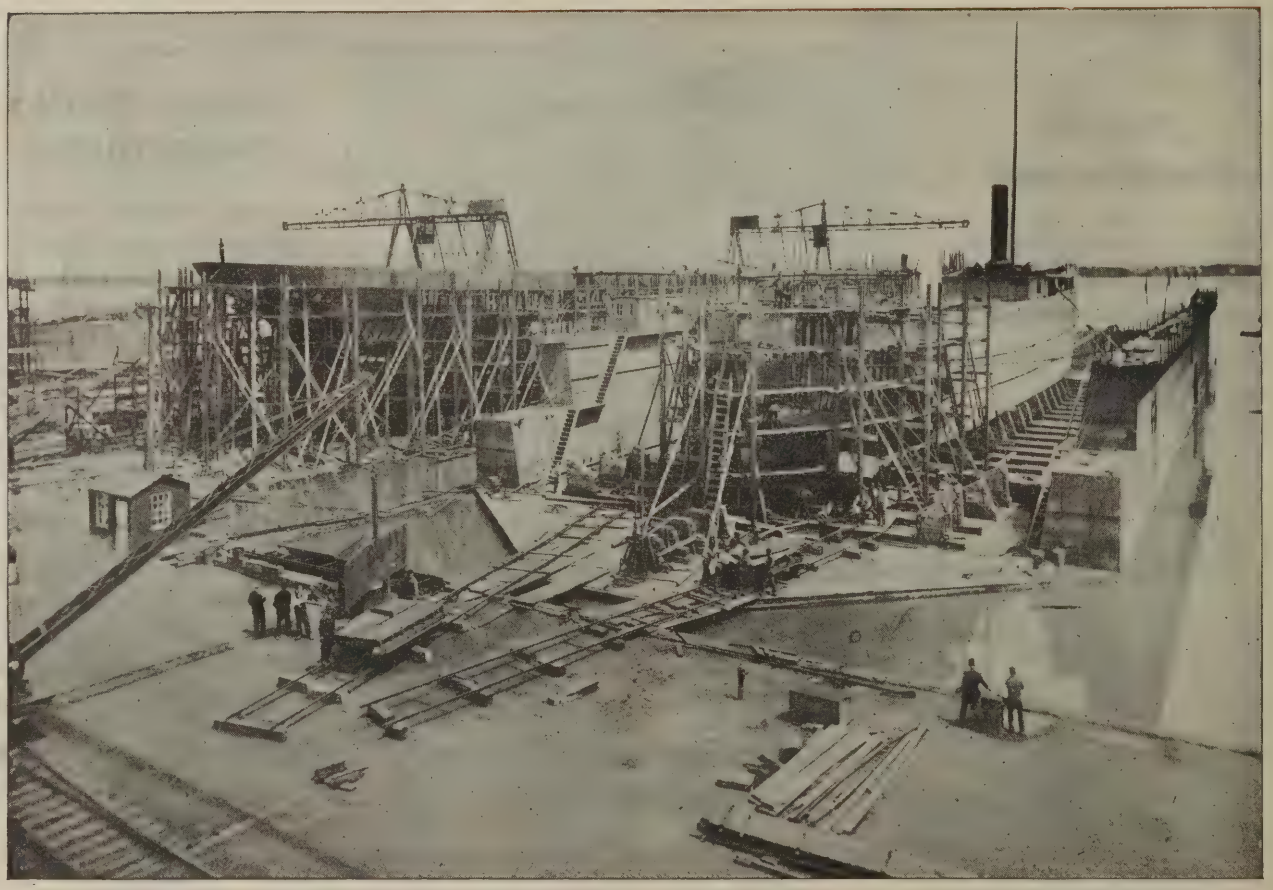

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THE MARINE REVIEW

VOL. 40. CLEVELAND, JULY, 1910. NEW YORK No. 7

New Concrete Piers at San Francisco

IN AN article describing the harbor of San Francisco in the February issue of THE MARINE REVIEW, brief mention was made of the new steel and concrete piers under construction by the board of state harbor commissioners. The design of these piers is an embodiment of the latest modern ideas on wharf construction and their character is such that they will set the pace in dock building on the Pacific coast for some years to come. A detailed study of the construction of the new piers is well worth while.

The harbor works of San Francisco are all owned and controlled by the public through the medium of the board of state harbor commissioners. Under these circumstances it is refreshing to note that although the new piers are of a most expensive type and are among the largest on the Pacific coast, their cost is not being charged to the taxpayers of San Francisco but is being liquidated through the earnings of the piers themselves, which under the economical management of the harbor commissioners are sufficient to pay operating expenses, interest on the indebtedness and a sinking fund as well.

The Pacific coast is essentially a timber producing country. Lumber is cheap ($12 per thousand feet b. m. at Seattle for rough fir planks, caps, stringers, etc.), and consequently practically all of the wharves and docks on the western seaboard are timber construction. The adoption of designs in which no wood whatever is used, steel, concrete and glass being substituted, as a standard by the San Francisco harbor commissioners is therefore significant. Exhaustive studies have shown that even in competition with the cheap lumber of the Pacific coast, the permanent steel-concrete form of construction is more economical, operating expenses and maintenance considered. Pacific coast communities, also, have now advanced to the point where they can afford the necessarily heavy initial investments and the more permanent form of construction is only a natural consequence. The new concrete piers at San Francisco mark the beginning of

S. S. DAKOTAH AT PIER 40, JULY 19, 1909.

the end of the famous timber wharves on the western seaboard.

The new piers, known respectively as Nos. 38 and 40, are situated at the foot of First street, San Francisco, where there is plenty of deep water and room for maneuvering large vessels. The docks are designed for handling over-sea freight of miscellaneous character and for berthing ocean going vessels. The designed safe floor load is 500 lb. per square foot.

The piers are 650 ft. in length and 130 feet in width, supported on reinforced concrete piles, with reinforced concrete floors and walls. No wood whatever is used and the structure is absolutely fireproof. The warehouses are 108 ft. wide and 630 ft. long, leaving 11-ft. open gangways on either side and 20 ft. at the outer end.

A sea wall 1,127 ft. in length was constructed at the inner end of the piers. Work on the sea wall was commenced in June, 1907, and the wall was completed June 4, 1908. The method of building the sea wall was as follows: First a trench about 100 feet wide was dredged to hard bottom or as near thereto as practicable. Broken rock, the pieces varying in weight from five pounds to several tons, was then dumped into the trench, forming a core wall of loose rock about 60 ft. thick. On the top and water side of this core an armor of stones varying in size from one to four cubic feet was placed, the armor being hand laid above low water. This wall cost $97,249.95 or about $87 per foot of length. In the opinion of the assistant state engineer, Ralph Barker, this type wall is not satisfactory. Mr. Barker states: "Its principal fault lies in that it allows the free flow of the tide through it, which carries away the fill behind the wall, making it difficult to maintain the thoroughfare approaching the piers. It is also faulty from the fact that it is difficult to obtain a foundation which will prevent the settlement of a wall of this type." Mr. Barker recommends a type of sea wall impervious to tides, and built on a foundation which will not settle.

S. S. California at Pier 40, July 28, 1909.

The piers are built out at right angles to the sea wall but are not dependent upon it for any support.

On account of the ravages of sea-worms, pile or timber wharves are very difficult to maintain on the Pacific coast and the problem of properly and economically supporting the new wharves was the most serious one which the engineers had to meet. Some engineers advocated solid stone piers or piers built with a heavy stone fac-

Piers 38 and 49, July 7, 1909.

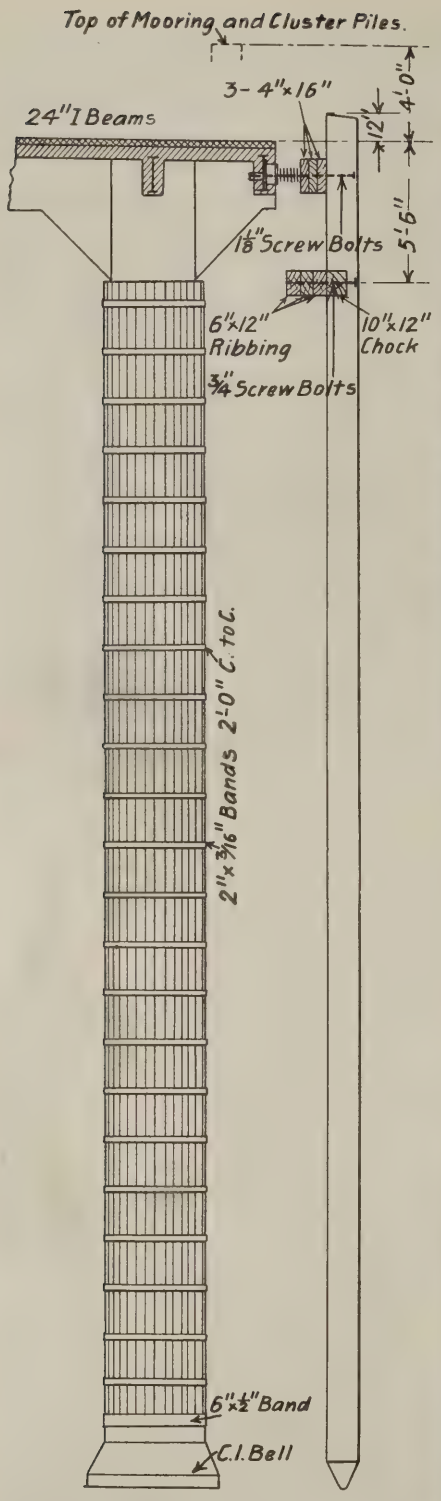
ing filled with earth. The enormous cost and the difficulty of finding sufficiently solid foundations for such structures is a strong argument against them. While such piers are permanent, it is claimed that the new San Francisco piers supported on concrete piles are equally permanent, much less expensive and easier to construct.

On account of the activity of the two species of pile worms, the limnoria terebrans above low water and the teredo navalis below low water, the life of untreated piles is confined to a few months. Under favorable circumstances a creosoted pile has a life of from 20 to 25 years. Eperience goes to show, however, that due to the many vicissitudes to which a pile is subjected, especially where exposed to collision from vessels, where careless employes find it necessary to bore holes and neglect to properly protect them and where the work of creosoting, while being good as an average is somewhat irregularly performed, the teredo has managed to reduce the theoretical 25 years of life to actual period of about 12 years.

For these reasons concrete piles of two styles have been adopted at San Francisco. The older style, invented by Howard C. Holmes, consisted of a core usually of the three piles driven in a close cluster surrounded by a reinforced concrete cylinder. The new design, adopted for the piers under consideration, is a modification of Mr. Holmes, patent devised by Ralph Barker, assistant state engineer. The modification is suitable only for the conditions existing at the point where these piers are constructed. Exhaustive soundings were made at the site, and at a depth of 50 ft. below the floor of the piers there occurred a stratum of stiff clay and sand which it was very difficult to penetrate with a pile. It was decided that this soil was capable of safely supporting a load of 10,000 lb. per sq. ft. Actual test loads up to 30,000 lb. showed no settlement. The pier foundations were proportioned accordingly. The piles consist simply of a concrete cylinder reinforced with eight 1-in. square twisted bars and also a spiral wrap of ¾ x ⅛-in. flat steel, laid with a pitch of 9 in. The outside diameter of the concrete shaft is 3 ft. 6 in. The pile terminates at the bottom in a cast iron bell which gives a bearing at the foot of from 21½ to 26 sq. ft., varying diameters of bells being used. In setting the piles, a wooden form built of fir staves hooped with steel bands spaced 2 ft. on centers is sunk to the hard pan level, the cast iron bell or shoe being bolted to the bottom of this form. All the mud and water is pumped out of the form and the reinforcing and concrete is inserted. The

PIER UNDER CONSTRUCTION, SHOWING CONCRETE PILE IN PLACE.

PIER 38, JULY 28, 1909, SHOWING FORMS AND FALSEWORK IN PLACE.



SECTION OF OUTER END OF PIER, SHOWING CONCRETE PILE IN PLACE.

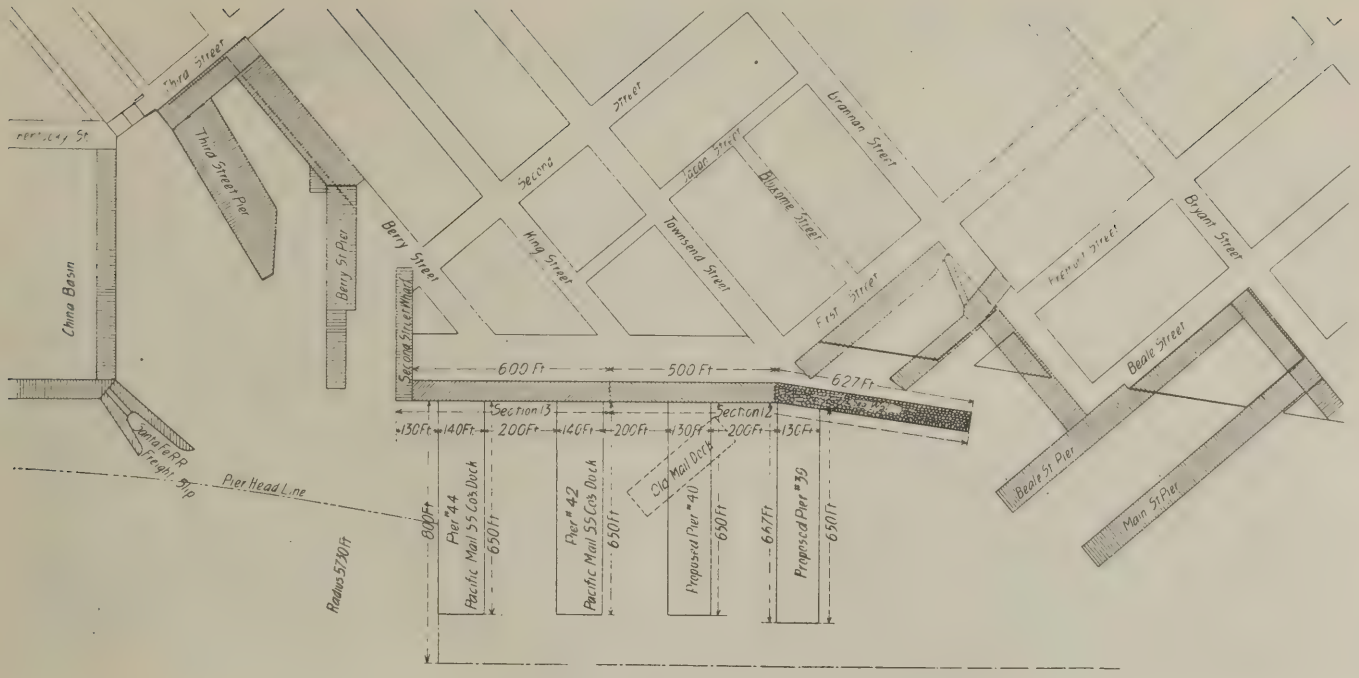
form remains on the pile, in time rotting away. In this manner a solid permanent concrete pile continuous to hard pan is obtained. The piles are spaced on 15-ft. centers lengthwise of the dock and on 13-ft. 4-in. centers across the dock, giving one pile for each 200 sq. ft. of floor. Heavy knee braces connected to the superstructure are fitted to the tops of the piles, giving lateral stiffness.

A series of I-beams is laid on the tops of the piles. Twenty-four-in. continuous 80-lb. beams are laid across the dock, on every row of piles, parallel to the shore, or 15 ft. center to center. Eighteen-in., 55-lb. I-beams, spaced 6 ft. 8 in. center to center, are laid parallel to the long axis of the dock intercostal with the 24-in. beams. These beams, thoroughly bedded in concrete for protection against the elements, carry the floor, which consists of reinforced concrete slabs, protected by an asphalt wearing surface on the sides of the pier and with a broad team-way in the center paved with vitrified paving brick. The walls are of ordinary reinforced concrete construction, the roof being carried independently by steel columns built of plate and angles or consisting of single channels. The wall reinforcement consists of 7/16-in. rods spaced 18 in. horizontally and vertically. The reinforced concrete roof is supported by steel trusses spaced 30 ft. apart.

FILLING INSHORE PILE FORMS WITH CONCRETE.

CYLINDER FORMS IN CONSTRUCTION.

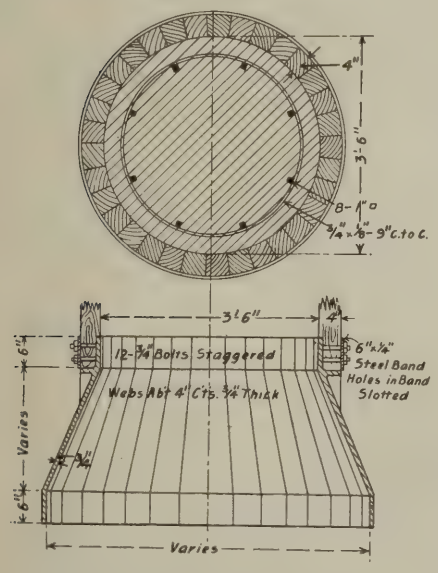
Twenty rolling steel doors in each side of the warehouse and two on each end are provided. The doors are 20



GENERAL PLAN, SHOWING LOCATION OF NEW PIERS AND NEW SECTION OF SEAWALL.

ft. wide and 18 ft. high in the clear.

At each of the outer corners a pro-



DETAIL OF CAST IRON BELL, WHICH IS FITTED TO BOTTOM OF EACH CONCRETE PILE.

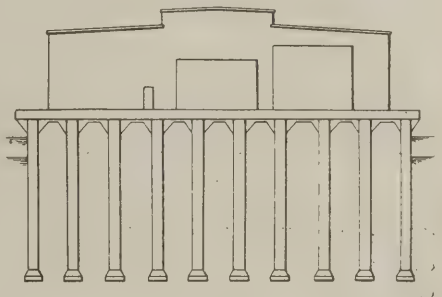
tecting dolphin consisting of about 48 60-ft. piles driven in a close cluster, is placed, while the sides and end of the pier are protected by a row of fender piles spaced 3 ft. on centers.

A railway spur connecting with the belt railroad traverses the full length of each pier, the rails being supported by intercostal 24-in. 80-lb. I-beams spaced 4 ft. 10 in. apart.

The piers are not provided with cranes or freight handling apparatus, the tackle aboard ship being depended upon for loading and unloading. The minimum depth of water alongside the docks is 25 ft.

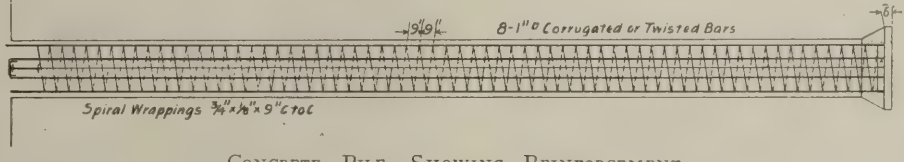
LIABILITY IN LOADING.

In the case of Taylor vs. United Fruit Co. et al., recently decided by the supreme court of Louisiana, it appeared that the defendant company had in its possession and under its control as charterer a steamship named the Bertha, employed one Legeal, who was engaged in the business of loading and unloading ships and having a number of men under him to load a cargo of crossties upon the steamship. While the latter's workmen were in the hold of the vessel to receive and properly stow the ties when received there, others upon the shore were engaged in swinging the ties therefrom on to the vessel. It appeared that when the men first went into the hold the hatch above was open, but later, by direction of one of the officers of the defendant company, the mate of the ship covered a portion of the open hatchway. The cover was improperly and insecurely placed over the hatch, so that when the ties were being lowered into the hold they struck this covering, dislodged it and caused it to fall upon the men below in the hold. The plaintiff, who was severely injured by the falling cover, sued both the company and the defendant, Legeal, to recover damages for the injury so received by him. A judgment in his favor was affirmed by the supreme court, which held that under the circumstances the defendant company was legally responsible for the injury.



END ELEVATION OF NEW PIER.

The Harlan & Hollingsworth Corporation, of Wilmington, Del., has been awarded a contract by the Central Hudson Steamboat Co., for a steamer 280 ft. long, to carry 3,100 passengers and to have a speed of 20 miles an hour. The new craft is to be launched next April and will be named B. B. O'Dell Jr.



CONCRETE PILE, SHOWING REINFORCEMENT.

The Port of New Orleans

By E. L. Hawes.

As a port, the city of New Orleans presents some perplexing problems to the business world. This is the consensus of opinion among maritime men, planters, exporters and freight forwarding brokers, both here and throughout that territory which is tributary to this metropolis. The problems arise chiefly from two causes, steamship discriminations and the extraordinary expense of labor and handling charges. These obstacles are so great that during the past two years the state government has expended more than $40,000 in an investigation and no one has received any satisfaction from it with the exception, possibly of some labor unions.

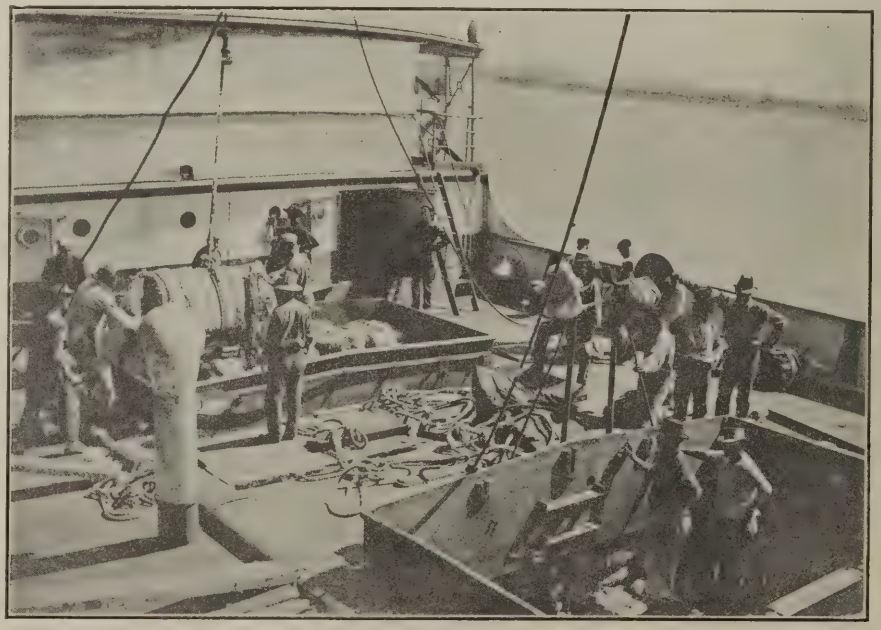
Yet despite these drawbacks, which are openly confessed by all classes of business men, the commerce is steadily on the increase and the shippers are working with commendable courage against political pressure and gang administration towards a solution. The greatest increase has been in the coffee importations, which in ten years have grown from 300,000 bags per annum to more than 2,500,000 or a value of more than $25,000,000. The business men are not discouraged, however, as plans are now being developed for the construction of large storage warehouses which will be equipped with labor saving devices which it is stated, will reduce the handling charges about $1.05 a ton less than at present. These will also solve the problem of labor domination by the levee unions, thirteen of which have an affiliated membership of more than 13,000 and completely control the municipal political situation in critical moments.

Even the most pessimistic concede that the obstacles are merely of a temporary nature and such as can be cured by aggressive action on the part of public spirited men. It is undeniable that the harbor of New Orleans is unsurpassed on the American continent. Already there is 4½ miles of wharf front improved with modern and almost indestructible steel sheds costing more than $2,500,000. Contracts are about to be let for another shed 3,176 ft. in length and 200 ft. wide, which with its equipments, will cost $320,000. These facilities are all under public control, being administrated by the Board of Port Commissioners, a body of public spirited and energetic men appointed by the state without regard to political affiliation. They have plans for the improvement of wharf space over a much larger area and it is hoped ultimately that the wharf frontage of New Orleans will be in excess of 30 miles on either side of the river. The harbor affords a safe roadstead in storms, being 110 miles from the open sea and of an average width of ½ mile and depth of 250 ft. in the channel.

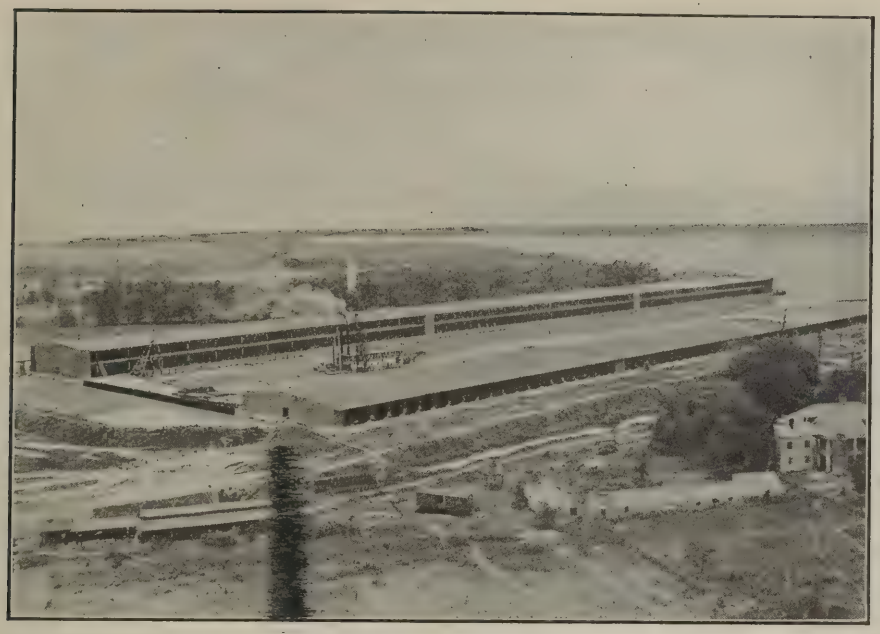
The Illinois Central Fruit Wharf, Showing Central American Fruit Vessels Unloading Cargoes by Machinery.

In fact, a battleship can come up to the wharf and be tied up as the average depth at the berths is about 30 ft. This was done last year, when the battleship Mississippi made her celebrated cruise up to Natchez, the head of deep water navigation, more than 400 miles from the mouth.

And not alone have millions been spent on the public wharves. Two of the greatest railroad systems of America, the Illinois Central and the Southern and Frisco railroads, have built and improved wharves at both ends of the public water front. The Stuyvesant docks of the first named lines are more than a mile in length, with an average



Stowing Cotton by Hand in One of the Large British Cotton Carriers.



THE MARINE TERMINALS OF THE FRISCO-SOUTHERN RAILWAY AT CHALMETTE SLIPS.

width of 200 feet. Two huge grain elevators, equipped with the most approved drying and handling facilities are situated in proximity with the wharves and the cars can be unloaded directly into the warehouses. The warehouse has storage capacity for 400,000 tons or fifty cargoes of 8,000 tons. These berths are also served by the Public Belt railroad, a municipal switching facility which serves every industry and wharf both public and private in the port. The Stuyvesant docks with their storage yards, whose capacity is more than 5,000 cars, cost more than $4,000,000.

At the other end of the port which covers three parishes, Orleans, Jefferson and St. Bernard, is the magnificent set of marine terminals of the New Orleans Terminal Co., a corporation owned jointly in equal part by the Southern Railway and the Frisco systems. This cost $11,000,000 and contained the only slip in the port. Along either side of the slip, which has an average depth of 45 ft. and is 1,800 ft. long, are the storage and unloading warehouses. These are of steel construction and will have when finished two stories, the lower for the outbound cargo and the upper for the inbound. The slips will accommodate berths for more than 12 vessels of 400 ft. keel each, which can lie with equal safety inside and outside of the slip. The terminals are served by the Public Belt and the New Orleans Terminal belt which has interchange facilities with all lines.

New Orleans has steamship lines to all the larger ports of the United Kingdom, Germany, France, Spain, Italy, Denmark, Holland, Sweden, Austria, Portugal, Russia, Greece, Central America, Mexico, Cuba, Porto Rico, Panama, Brazil and the Argentine, many of which have regular liners. The largest tonnage goes to the United Kingdom, France, Central America and Germany, although the Adriatic ports are served by monthly sailings. The tonnage of vessels last year was 4,748,104, of which 3,935,538 went to the public wharves. The value of the imports last year was in excess of $40,000,000 and the exports many times that amount. The port is now the leader in imports of bananas, cocoanuts and sisal grass and holds third place in exports of cotton. The port charges amount to 2 cents a day per ton for the first three days and 1 cent for the next six days, making a maximum charge of 9 cents a ton for 36 days wharfage. The average charge last year was 7 cents a ton.

THIRTY-FIVE THOUSAND BAGS OF COFFEE ON THE WHARF AT NEW ORLEANS, PART OF THE LARGEST COFFEE CARGO EVER RECEIVED IN NEW ORLEANS.

CHESAPEAKE STEAMSHIP CO.'S NEW STEAMERS.

The Chesapeake Steamship Co. awarded contract to the Maryland Steel Co., Sparrows Point, Md., for the construction of their two new steamers, to be called the City of Baltimore and the City of Norfolk. These two steamers will unquestionably be the most modern and up-to-date steamers on the Chesapeake bay.

They will be 310 ft. long over all, beam molded at deck 46 ft., beam molded at water line 42 ft., beam molded over guards 60 ft., and they will contain 147 staterooms, 12 of which will connect with baths, which will have hot and cold fresh and salt water, and ten rooms with hot and cold fresh and salt water shower baths. This is a new feature and one that will no doubt prove attractive to the traveling public.

The dining-room, which will be on the hurricane deck forward, will have a seating capacity of 60 persons. The kitchen and pantry will be next to the dining-room so that the service will be prompt and first class in every particular. The balance of this dock will be devoted to staterooms, except aft, where there will be a new feature in the shape of a lounging-room for ladies and gentlemen. Next to this will be the wireless telegraphy room. The main saloon deck will be

BUSY SCENE ON THE LEVEE DURING THE COTTON SEASON, SHOWING THE STEEL SHEDS OF THE HARRISON LINE.

devoted entirely to staterooms, while the main deck will be for freight, except aft, where there will be a commodious smoking-room, with bar adjoining.

The machinery will consist of a 4-cylinder, triple-expansion, surface condensing engine, and will have cylinders 24½-in., 40, 47 and 47-in. diameter by 42-in. stroke. These steamers will also be equipped with their own refrigerating plant, thus affording cold storage facilities for taking care of dairy products, as well as refrigerating all supplies for their own use.

Special attention has been given in drawing plans and specifications to every facility for a prompt and careful handling of all freight cargo. The steamers will carry 650 tons of high class merchandise freight.

COMBINATION ENGINES.

Having passed beyond the experimental stage, the employment of combination engines for long voyage passenger liners continues to make headway. Curiously enough, it is in vessels engaged in trading between England and Australasia that the adoption of this type of engines is most in evidence. The latest Orient liner to be built on the Clyde will have duplicate sets of reciprocating engines for her wing propellers, with a low-pressure turbine for her midships screw. In this respect she will be similar to the 12,000-ton liner Demosthenes, which the Aberdeen-White Star Line will place in their London-Australian service about April of next year.

The New Zealand Shipping Co. has the credit of being pioneers in this respect, so far as the Australian and New Zealand trade is concerned. About a year ago, their cargo vessel Otaki, which has combination engines, made her maiden voyage to New Zealand ports. Built as she was on similar lines to one of the company's full-powered steamers possessing the ordinary type of reciprocating engines, the owners were able very accurately to draw comparisons between the performances of the two types. That the New Zealand Shipping Co. is satisfied as to the advantages of combination engines is proved by the fact that their latest passenger steamer, the Rotorua, is engined on the same lines as the Otaki.

The promise is that for liners not needing a very high speed, combination engines will find increasing favor.

THE MACHINERY OF NEW BRITISH WARSHIPS.

The six special torpedo boat destroyers just ordered by the British Admiralty will prove exceedingly interesting craft from an engineering point of view, and their sea performances will be awaited with deep interest. The two vessels entrusted to the Parsons Marine Steam Turbine Co., the hulls of which will be constructed by Messrs. William Denny Bros., Dumbarton, it is reported, will be propelled by Parsons geared turbines; the two to be built by Messrs. Yarrow & Co., Scotstown, will be fitted with Brown-Curtis turbines, and the remaining two, given to Messrs. J. I. Thornycroft & Co., Southampton, will be propelled by Parsons turbines driving twin screws. The contracting firms are given a perfectly free hand in the design and construction of the propelling machinery, and as a result of this calling to their aid the technical skill and experience of these famous torpedo craft constructors, it is not unlikely that the Admiralty will succeed in improving the efficiency of the destroyer.

STUYVESANT DOCKS, THE PRIVATE MARINE TERMINALS OF THE ILLINOIS CENTRAL SYSTEM, SIX MILES ABOVE THE CITY FRONT.

The T. S. Marvel Shipbuilding Co., Newburgh, N. Y., has been awarded the contract for the hull and carpenter work of the new sidewheel steamer for the Catskill Evening Line, which will be 285 ft. long over all, 66 ft. beam over guards, and 12½ ft. deep.

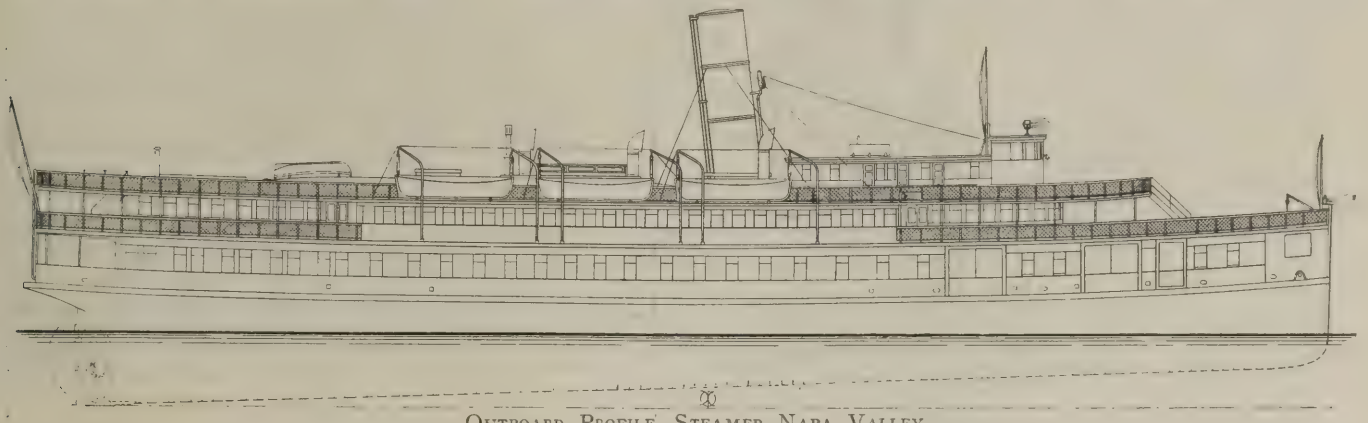
San Francisco Bay Steamer Napa Valley

NAPA VALLEY, recently completed by the Union Iron Works Co., of San Francisco, for the Monticello Steamship Co., for passenger and excursion traffic on San Francisco Bay between the cities Vallejo and San Francisco, is one of the finest vessels of its kind built on the Pacific coast in 1910. She is a single screw steamer with an over all length of 240 ft., between perpendiculars 230 ft., beam at waterline, 38 ft.; over guards, 49 ft.; molded depth, 16 ft.; and draught, 9 ft. 6 in.

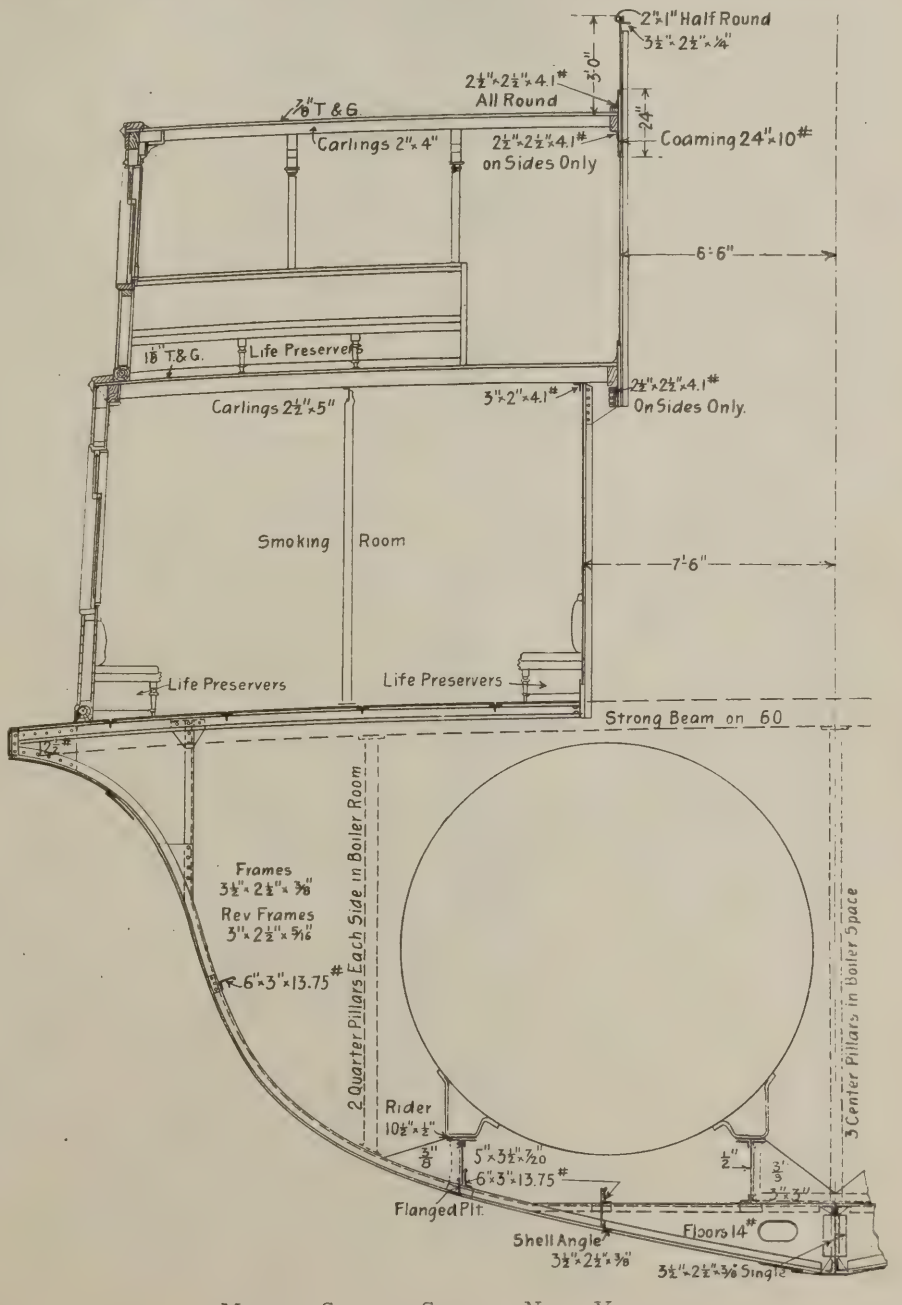
There are four decks; lower, main, saloon and texas, respectively. On the texas deck are the pilot house, rooms for officers, reception rooms, six life boats, four life rafts, saloon skylight and seats for passengers. The saloon deck is continuous, open at the forward end and has a length of 152 ft., with a breadth of 41 ft., with seating capacity for 800 persons. The seats are grouped forward and aft with a double row on each side, surrounding the engine and boiler room hatches and passages. Abaft this saloon are the toilets and retiring rooms for women. Outside in the open spaces at either end of the saloon deck slat seats are fitted.

The forward portion of the main deck is arranged to accommodate general cargo and bulky material, as vehicles, with two large gangways on either side. The deck in way of the cargo space is sheathed with wood, the remainder being covered with linoleum, except in the galley, pantry, and toilet rooms, which are cemented. Aft of the cargo space is the smoking room with a wide stairway leading down to the buffet and barber shop on the lower deck directly below the cargo space. Leading aft from the smoking room a wide passage way opens into the galley, pantry, mess room, store room, refrigerator, men's lavatory and accommodations for engineer and assistant engineer, steward and purser. A stairway leads up to the saloon and another to the engine room on the lower deck. At the after end of the main deck is located the dining saloon, with a serving table in the center around which are grouped 18 tables with seating capacity for 84 persons. The extreme aft end of the main deck is open.

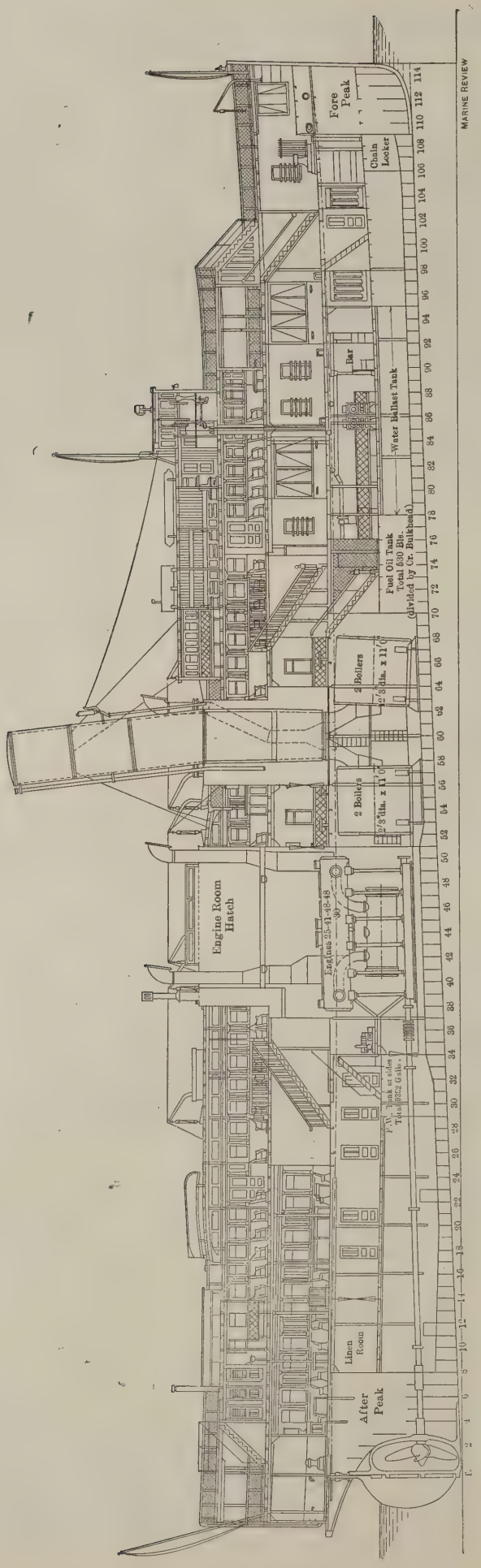
Forward of the buffet on the lower deck are lockers and quarters for six firemen and 12 seamen. Aft of the engine room are the quarters for the

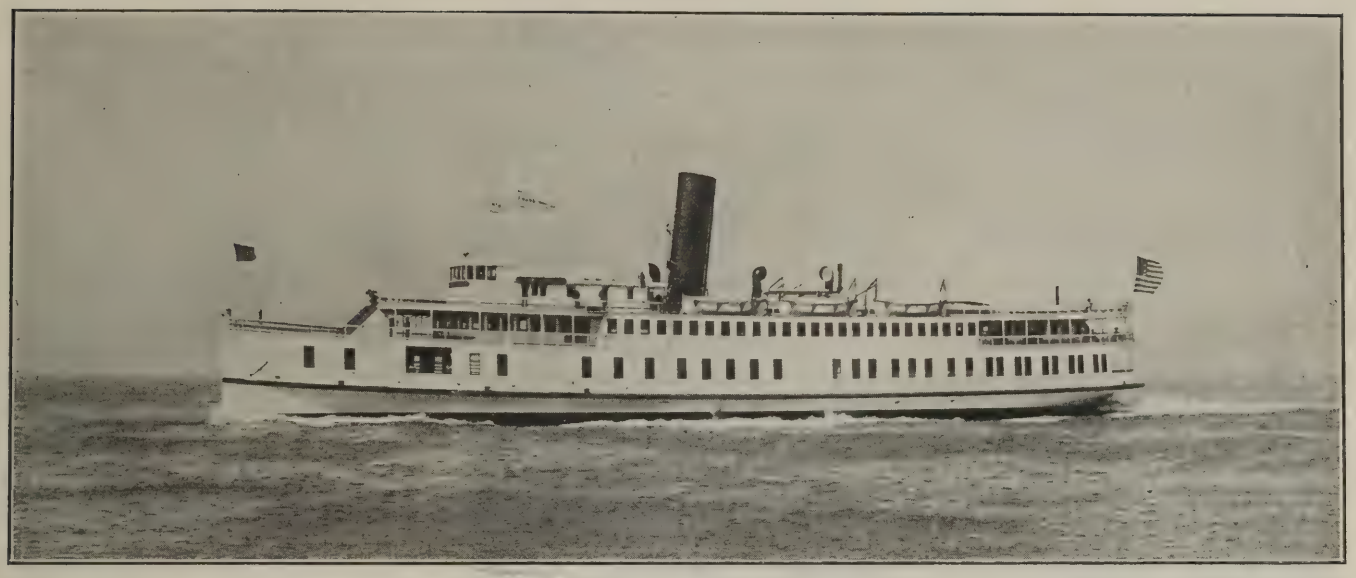


OUTBOARD PROFILE, STEAMER NAPA VALLEY.



MIDSHIP SECTION, STEAMER NAPA VALLEY.


MARINE REVIEW
Fore Peak
Chain Locker
Bar
Water Ballast Tank
Fuel Oil Tank
Total 630 Bls.
(divided by Cr. Bulkhead)
2 Boilers
2 Boilers
Engine Room Hatch
Liners
Liners
Liners



STEAMER NAPA VALLEY, OF THE MONTICELLO STEAMSHIP CO.'S FLEET.

bearings lined with white metal. The main bearing binder bolts are fitted with graduated nuts.

Balanced slide valves are used on the low pressure cylinders and the high pressure and intermediate cylinders are fitted with piston valves working in cast iron liners. The valve gear is of the usual double-bar link type. Piston rods are of nickel steel, 5⅛ in. diameter and are interchangeable and fitted with Watson metallic packing. Connecting rods are of the forked type, 75-in. centers, the top end fitted with bronze boxes and the lower end with steel boxes lined with white metal. Cross-head pins are 7½ x 6½ in. The crank shaft is solid forged, 11½ in. in diameter, and made in two sections, with the cranks in each section placed at 180 degrees; the line shaft is 11 in. diameter and the propeller shaft 11¾ in. diameter. The propeller is sectional with cast iron hub and cone and bronze blades. The stern tube is of the usual type, of cast iron, with composition liners fitted with lignum vitae staves. The reversing engine is of the ordinary direct steam type, with floating valve gear. A two-cylinder, 4 x 4-in. turning engine and ratchet hand gear are also fitted.

The four single-ended boilers are set in two batteries facing each other fore and aft, with fire room between. Oil fuel is used exclusively. The boilers are 12 ft. 3 in. diameter, 11 ft. long between heads and contain three 34-in., removable, suspension type furnaces with common combustion chambers. There are 322 2½-in. tubes, 7 ft. 6 in. long, and every fourth tube in both vertical and horizontal rows is a stay tube. The heating surface in each boiler is 1,970 sq. ft. The boilers are designed for a working pressure of 180 lbs.

A fuel oil tank with a capacity of 26,500 gal. is fitted directly forward of the boiler room.

The surface condenser is independent and the cooling surface 4,250 sq. ft. The circulating pump is of the centrifugal type, with a capacity of 4,000 gal. per minute. The air pump is of the Blake vertical simplex type, 14 x 24 x 18 in. Independent feed, fire, sanitary and fresh water pumps are also fitted.

One 7-K. W. and one 20-K. W. G-E turbo-generators supply current for about 325 incandescent lamps and one standard search light. The usual call bells, speaking tubes and telegraphs are fitted throughout. Altogether the Napa Valley is one of the best examples of a passenger steamer on the Pacific coast, and it is claimed that on her trial trip she attained a speed of 20½ statute miles per hour.

FACTORS CONTRIBUTING TO SPEED IN SHIPS.

There is a chapter in Brassey's *Naval Annual* on engineering problems, and Alex. Richardson, who contributes it this year again, has been able, in a complete thesis on the "Efficiency of the Factors Contributing to Speed in Ships," to afford information regarding the development of the moment. He pleads for a fuller measure of efficiency in speed, contending that engineers are now beginning to realize more fully that what must be aimed at is not the best results of the boiler, engines, or propeller separately, but the efficiency of the whole combination, taking into account the proportions of the hull for a given displacement, the lines of the ship, the quality of the coal, the evaporation of the boiler, provision against heat radiation from the pipe connections, the thermo-dynamic efficiency of the turbines and the auxiliaries, the value of high vacua, and the efficiency of the propeller.

He shows that the steady development in the length of battleships and cruisers has conduced to higher speed. A careful estimate of the probable effective power required for overcoming the resistances in a 27-knot ship shows that, in a vessel of 530 ft. long between perpendiculars, and of 17,250 tons displacement (like the Invincibles), the power required to overcome skin-friction resistance is equal to about 0.84, and that to meet residuary resistance to about 0.85 effective horsepower per ton displacement; whereas in the latest British cruisers of 660 ft. long between perpendiculars and 26,350 tons displacement—these figures may be 0.75 and 0.68 respectively per ton displacement, a saving of about 15 per cent in the total effective horsepower per ton displacement. As confirmation of this, it is stated that had the Lusitania and Mauretania been 700 ft. long instead of 785 ft., the power necessary to attain their speed would have been at least 10 per cent greater.

Data are given regarding trials of the Parsons partial-admission turbines, wherein it is shown, by comparison with an ordinary high-pressure cruising turbine, that the increase in the total power of a ship for the same quantity of steam is about 7 per cent. This is sure to be improved upon with experience. But perhaps of greater interest is the practice of fitting an impulse first-stage wheel in combination with reaction blading in turbines, as there is a great possibility of increased economy, especially at low powers, by such a combination, while at the same time greater simplicity and strength in manufacture is achieved than with compound-impulse turbines as fitted to each shaft in some European ships. For the lower powers

the steam would pass from the impulse stage to the second stage in the reaction part of the turbine.

One point which is strongly enforced is that there is no obstacle to the application of the Parsons type as an independent unit on each shaft; indeed, such an application is at present in course of construction. The system of working in series with Parsons turbines on four shafts lends itself to high economy; and it is pointed out that in the new Spanish ships, as well as in the French trans-Atlantic liner France, the turbines in all four ships may be worked in series. There is one high-pressure, one intermediate, and two low-pressure turbines, the last on the wing shafts. The high-pressure turbine on the port inboard shaft exhausts into the intermediate-pressure turbine on the starboard inboard shaft, and the steam passes thence to both low-pressure turbines. It will be interesting to note the effect on steam consumption of this arrangement.

ROBERT H. LAVERIE.

Mr. Robert H. Laverie

ROBERT H. Laverie has been appointed to the office of chief surveyor of Bureau Veritas for the United States to succeed the late Henri Wilkinson. This appointment will be well regarded throughout the whole ship building and engineering industry, as Mr. Laverie's experience has been of an international character. He was born in Glasgow and began his training 21 years ago in B. & W. Henderson's yard in that city, following which he concluded a five years' course of training with G. T. Davie & Sons, Quebec, Canada, under his father, who had been superintendent at that plant for 24 years. After leaving Quebec Mr. Laverie spent a year and a quarter with the American Steel Barge Co. at West Superior, Wis., and became generally well known throughout the lake region. He then went for nine months to the Cramp ship yard at Philadelphia, following this with a similar period at the Newport News ship yard. He was for two and one-half years with the Herreshoff Co., at Bristol, R. I., one year with the Fore River Ship Building Co., Quincy, Mass., and one and one-quarter years with the Crescent ship yard at Elizabeth, N. J. For the past nine years he has been with the Townsend & Downey Ship Building Co., now the Shooter Island Ship Yard Co., at Mariner Harbor, N. Y. During his career at Shooter Island, a large number of vessels of all types were constructed under his superintendence, including the large tank vessels for the Standard Oil Co., several vessels for the United States government service, and among the cup winning yachts the famous Meteor for the Emperor of Germany, and the Atlantic, Elmina, Thistle and Neola.

Mr. Laverie is a member of the Society of Naval Architects and Marine Engineers, and of the Maritime Association of the Port of New York. He is one of the directors of the Mariner Harbor National Bank, and vice president of the Mariner Harbor Building & Loan Association. He is also a member of the Canadian Society of New York.

A NEW GOVERNMENT STEAMER.

The contract for the building of the United States steamer Woodbine has been awarded to the Waters-Colver Co., West New Brighton, Staten Island. The Woodbine will be a single screw, wooden steamer, to be used by the United States government, as a lighthouse tender; length over all 91 ft. 1 in., length on water line 86 ft., beam molded 16 ft., depth of hold 7 ft. 2¾ in., and a draught of 4 ft. 5 in. The Woodbine will be about 62 tons displacement and will be equipped with an Almy water tube boiler, 200 lb. pressure, a triple-expansion engine with cylinders, 8 x 13 x 21 x 16 in., swinging a wheel 4 ft. 7 in. diameter. She is designed for harbor and river work by the department of commerce and labor and will be built by the Waters-Colver Co., in a thoroughly first-class manner. The construction of the hull of the Woodbine is now under way and will follow the two new city steamers, Riker's Island and Hart's Island, which are being constructed at the same ship yards.

Marine Suction Gas Producer Engines On the River Rhine

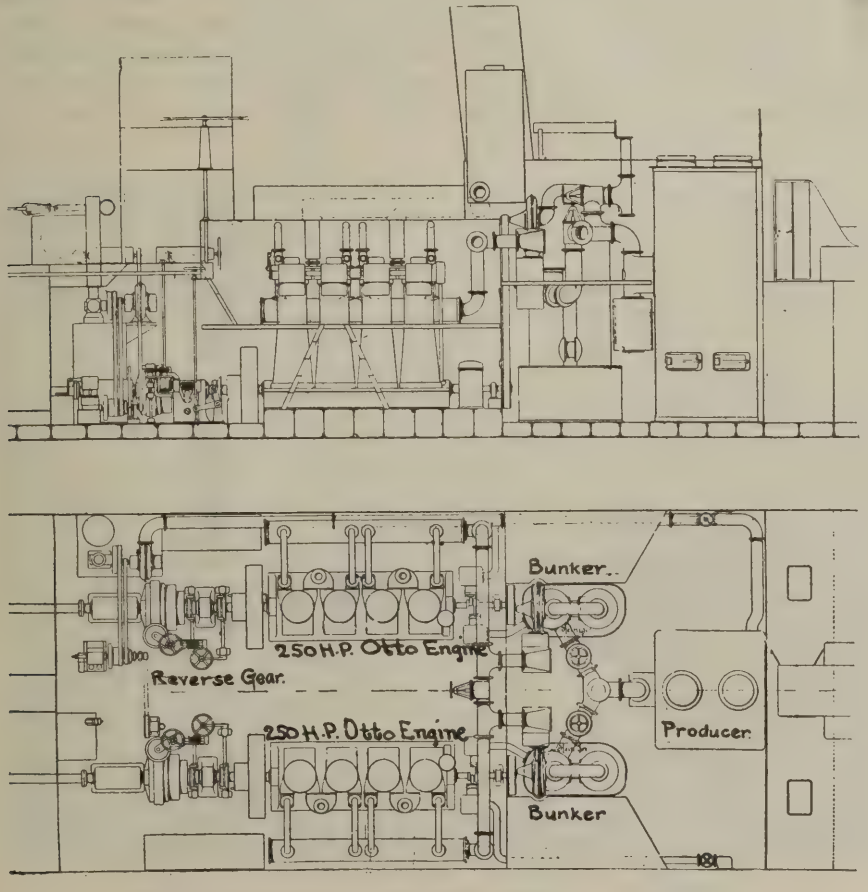
THE Otto Gas Engine Works in Germany first tried a producer gas engine for boat propulsion in 1901, and a number of canal boats with engines as large as 45 actual horsepower were sold by the German factory. On account of the considerable space occupied by the producer plants as then built, the business grew very slowly. Gasoline and kerosene engines almost monopolized the field. The successful operation of the marine producer gas engines on canal boats, however, indicated possibilities in the use of such plants on larger tow boats or tugs. Many attempts were, however, unsuccessful because they failed to realize the peculiar requirements of marine service.

With the further development of producers, it became possible to utilize brown coal briquettes as well as anthracite in those of the double-fire type, and as these briquettes can be obtained cheaply anywhere on the Rhine, the economical operation of larger boats with producer equipment became possible.

After making a careful estimate of the cost and condition of operation, the Otto Works found that the brown coal producer plant had a decided commercial superiority over steam, and the company decided to construct such a boat and the tug Deutz was equipped with a 500-i. h. p. gas engine plant in place of a 300-i. h. p. steam plant, requiring a lengthening of about 10 ft. The present dimensions and draught with 30 tons of briquettes on board, are: Over all length, 112 ft.; greatest width, 20 ft.; draught forward, 5½ ft.; draught aft, 6 ft.

The stack was retained to provide free outlet for the exhaust.

The whole machinery layout, as shown in the plan herewith, occupies a space 20 x 42 ft. The producer room is separated from the engine room by a bulkhead provided with a sliding door. The height of the producer room is 14½ ft. This room contains producer, gas cleaning apparatus, and the coal bunkers.



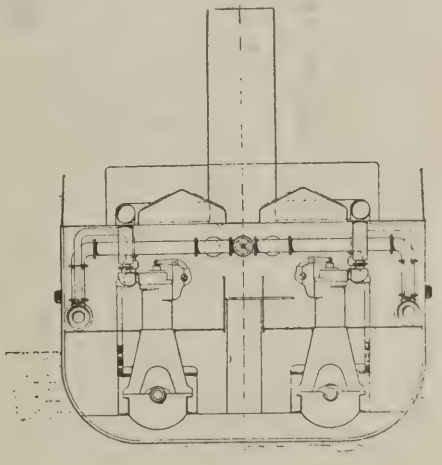
ARRANGEMENT OF GAS PLANT IN TUG DEUTZ.

The producer is of the double-fire type, in which all the volatile matter in the fuel must pass through the upper fire zone before it reaches the gas outlet, making the gas practically tar free.

The cleaning apparatus consists of two separate units, capable of independent operation. After passing through a small scrubber with a spray at the top, the gas enters the main scrubber, which is provided with eight spray heads, one above the other, and each removable while running. From the main scrubber the gas passes to a centrifugal washer, driven from the main shaft, and provided with suitable water sprays. The gas next passes through a water separator. The two scrubber units have a single pipe leading to the gas receiver and thence to the engine.

There are two four-cylinder, 250-h. p. engines, each driving a 5-ft. propeller through a reverse gear. The engine speed can be controlled between the limits of 90 r. p. m. to 200 r. p. m. from the engine platform. While maneuvering and picking up tows, one engineer and a helper operate the machinery. The helper also relieves the engineer during part of the long 16 to 18-hour day.

The gas engine and reverse gear are



said to be so well adapted to maneuvering, that the operation is even quicker and more certain than with a steam engine.

In the engine room are two pumps, one for delivering water to the jackets and scrubber, and another for pumping waste water from a well under the scrubber.

On the after port side of the engine room is placed a 7-h. p. auxiliary gasoline engine, which drives the compressor of the air starting equipment, and the exhauster for building up the fire in the producer. By a special belt it can be used for raising the anchor and also for pumping out. In regular operation this is done by the drainage pumps provided for the purpose. After the regular layover of six to eight hours, the plant can be started again in a quarter of an hour with absolute certainty.

The following table gives the weight

of the machinery parts in pounds per indicated horsepower.

Engine complete, including fly wheel and reverse gear	158
Producer, lining, scrubber, and water in apparatus	189
Pumps, auxiliary engine, and other parts	15½
Piping	13¼
Fuel in producer	13¼
Total	389 per i. h. p.

These weights, it is claimed, could now be considerably reduced.

The weight of a triple-expansion steam engine of the same indicated horsepower would be:

Engine	198
Boiler	176
Auxiliaries and piping	60
Water in boiler	62
Total	496 lbs. i. h. p.,

which is said to be a fair average.

It therefore appears that the marine producer gas engine plant is 20 per cent lighter than a steam plant of the same indicated horsepower and requires less room. The cost of the gas plant is about 10 per cent greater than that of the steam plant.

The suction gas tug Deutz had by Sept. 20, 1909, or about three months after its first start, already made 12 round trips, or 1,200 hours of towing, which speaks well for its reliability of operation. The tug can average 3⅛ miles per hour against the river current with two loaded tow boats with a total paying cargo of 3,200 tons. The tug with its tow makes a round trip in a little over 100 hours. Including coal used by auxiliaries and coal used during layovers, it averages 550 lbs. of lignite briquettes per hour. This average is for 719 hours' run, and includes all coal burned during this time. At a cost of $2.16 per long ton for the briquettes, the fuel cost for the round trip is $\frac{100 \times 550 \times 2.16}{2240} = \$55.00$. A barrel of lubricating oil containing 50 gallons is used each round trip. The crew for 16 to 18 hours, consists of captain, wheelsman, machinist, helper, one or two laborers, and a sailor, or six to seven people in all.

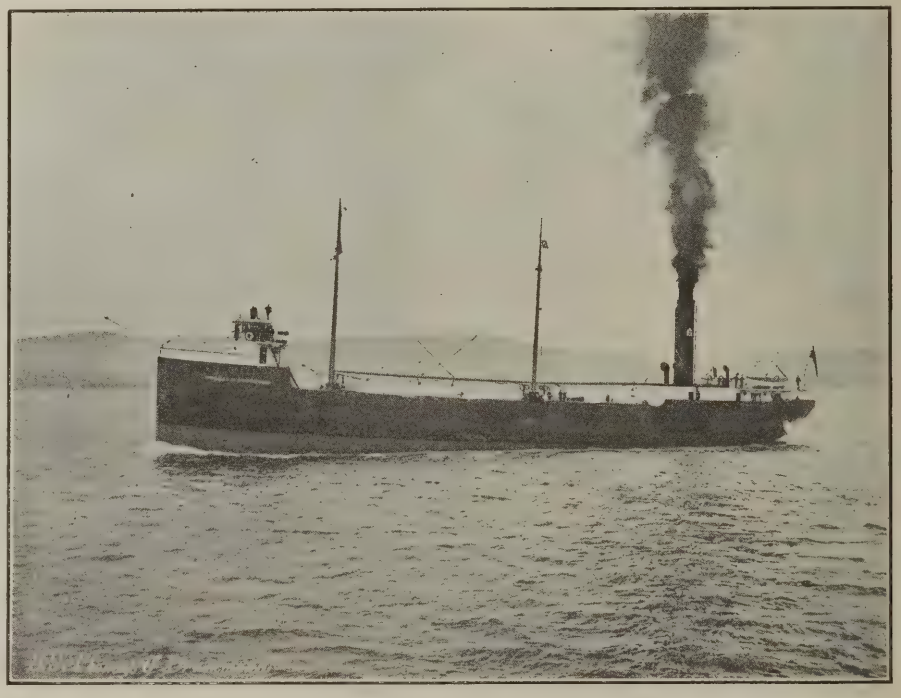
The attention to the producer consists principally in coaling, which is done by raising fuel by the bucket, using a winch, which is arranged to make it easy to drop the coal directly into the producer. There are two such lifts, one each for the port and starboard bunker. The fire is coaled every half hour, using one bucket from each side. Every two hours the grate is shaken a few times and every eight hours the fire is clinkered. This work is done without dust or dirt.

It is true that a steam plant of the same rated power can carry an overload occasionally, or even steadily, but this is at the expense of fuel economy. A steam plant cannot hope to use less than 2½ to 3 times as much fuel for the same work under the most favorable conditions, and when driven beyond its rating, it smokes badly and the fuel economy is even worse. The gas plant has the advantage of being absolutely smokeless, and to permit forced driving, which has grown to be a custom, the rated power should be fixed with this consideration in view.

The gas power tug is said to have surpassed the expectation of the builders in every respect, and while no doubt considerable work is still required to perfectly adapt the design of the power plant to the various kinds of marine service, the foundation of success has been assuredly laid. We may look forward to seeing on all our rivers within a few years clean and smokeless producer gas power boats operating with an economy and efficiency formerly unattainable.

LAKE STEAMER THOMAS J. DRUMMOND.

Archd. McMillan & Son, Ltd., Dockyard, Dumbarton, Scotland, who have now constructed a large number of vessels for the Canadian lakes of both the bulk carrier and package freight type, have just completed an addition to the fleet of The Algoma Central & Hudson Bay Railway Co., in the steamer Thomas J. Drummond. The vessel, which is of the single deck type, is named after the president of the company, and is of the following dimensions: Length, 248 ft.; breadth, 44 ft.; depth, 26 ft.; is built to British Corporation survey, with scantlings entitling her to trade in any waters, and is specially designed for carrying rails and bulk cargo, her arrangements being such that these may be handled with the greatest possible facility. The hold space is divided into three compartments, and extra strength is introduced in the structure of the vessel where additional strains are likely to be experienced when engaged in her special trade. A cellular double bottom of extra depth over rule requirements, and fore and after peak tanks, are arranged for carrying water ballast. Her deck machinery, including winches, windlass, and capstan, is all arranged for the speedy and easy handling of the vessel. The steam steering gear is on the Wilson-Pirrie principle, working direct on to the rudder quadrant—the rudder being of the usual balanced lake type, and fitted with coupling to permit of easy removal. A large coal bunker is fitted on deck as well as bunkers alongside boilers, all arranged so that trimming can be practically dispensed with. Electric light is fitted throughout the vessel, including holds. Accommodation is provided in the forecastle forward for mates, wheelmen, watchmen, and deck hands; a suite of rooms with bathroom are arranged for owner, while the captain's accommodation, including bedroom, bathroom, office, and chart room is arranged in Texas house on top of forecastle. A wheel house is fitted on top of Texas house with



THE BRITISH-BUILT LAKE FREIGHTER THOMAS J. DRUMMOND.

telegraph for docking and telegraphs and whistle pulls to engine room. The engineers are accommodated aft, where also the dining saloon, pantry, galley, mess-room, and ice house are placed. The vessel is propelled by machinery of the triple-expansion, single-screw type, having cylinders 20½, 33 and 54 by 36-in. stroke, supplied with steam from two boilers 14 ft. by 10 ft. 6 in., working at a pressure of 190 lbs. The main engines are controlled by steam and hydraulic starting and reversing gear, and have also steam turning gear; Weir's special feed pump is fitted, also feed heater, Crompton's atmospheric self-tipping ash hoist, and the whole engine room equipment is thoroughly up-to-date.

The Drummond will be principally engaged in carrying steel rails from Sault Ste. Marie to Fort William and Georgian Bay ports.

Steel Screw Colliers Coastwise and Transportation

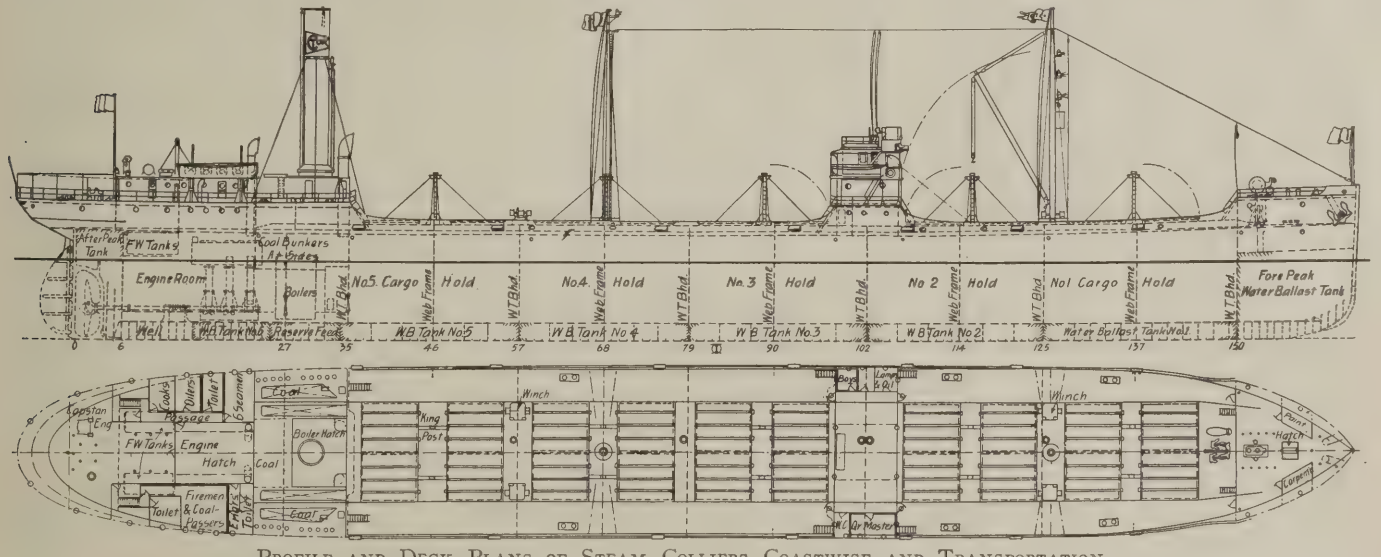
TWO steel single screw colliers were recently completed by the New York Ship Building Co., Camden, New Jersey, for the Coastwise Coal Co. trade between Baltimore and Boston; both are of the following dimensions:

Length between perpendiculars	360 ft.
Beam molded	49 ft.
Depth molded to upper deck	30 ft.
Load draught	22 ft. 6 in.
Deadweight at this draught	6,400 tons
Gross tonnage	4,015
Speed, loaded, at sea	11 knots

The vessels are of steel, built in accordance with the rules of the American Bureau of Shipping, single deck, with poop 76 ft., bridge 17 ft. and top gallant forecastle 34 ft. long, seven steel water-tight bulkheads, straight stem and semi-elliptical stern, with two pole masts. The five cargo spaces are clear of hold beams and pillars, the deck being supported by deep arched beams and web frame midway between the bulkheads, with a deep girder carried all fore and aft forming a trunk 24 in. above the upper deck. Ten cargo hatches 15 ft. 2 in. long by 27 ft. 6 in. wide are arranged closely spaced on top of the trunk to facilitate the rapid loading and discharging of the cargo. Hatch covers are steel, hinged in two pieces, water-tight and provided with special lifting gear and posts for supporting same when open. Two steam winches from which leads are taken for operating hatch covers, are placed on top of trunk at each end of the vessel.

Accommodation for captain's saloon, spare stateroom, officers, etc., is provided in a large steel deckhouse on bridge deck, with a pilot house on top of bridgehouse. Quartermasters, boys, toilet and lamp room are arranged in rooms at sides in bridge erection. The engineers are berthed in a deckhouse on poop deck alongside engine casing; the galley, messes, ice-room and galley stores being arranged abaft the same. Entrance to crew and firemen accommodation in poop is provided in the after deckhouse, and the seamen, firemen, oilers, assistant cooks, toilets, etc., are berthed in poop alongside engine casing. There is a steam windlass forward, the engine being located on the upper deck in the forecastle; the wild cats and warping drums are on the forecastle immediately above. A capstan is also provided on the poop deck with engine on upper deck below. Steam steering gear is fitted on the upper deck in the poop abaft the engine casing, with connection to pilot house. Auxiliary hand steering gear with right and left hand screw is attached directly to crosshead on the rudder stock. Two metallic lifeboats are provided and fitted under Mallory davits on the poop deckhouse, a wooden working boat being also provided on the bridge deck. Vessels are well provided with all the necessary bitts, cleats, etc., for mooring purposes, and a special towing bitt and chock is fitted aft. An extra deep double bottom is fitted for the carriage of water ballast, with feed water under the boilers. The fore and after peaks are arranged for water ballast. Coal bunkers are arranged at side of boilers and in 'tweendecks alongside boiler casing, with pockets to fire-room. The propelling machinery is placed aft and consists of two single ended Scotch boilers 17 ft. diameter by 11 ft. 4 in. long, with a working pressure of 175 lb.; triple-expansion engines of 1,700 I. H. P., with cylinders 24¼, 38½, 64 in. diameter by 45 in. stroke, with a surface condenser attached; propeller 16 ft. diameter.

The trial trips were run on the Delaware river course at Deep Water point in fully ballasted conditions, during which a mean speed of 13 knots per hour was obtained, with somewhat more than the normal horse power mentioned above. In loaded condition the vessels have maintained an average speed between Baltimore and Boston of slightly in excess of 11 knots, carrying a full coal cargo.



PROFILE AND DECK PLANS OF STEAM COLLIERS COASTWISE AND TRANSPORTATION.

What Is Needed On the Ohio

IF there is one river in the United States that should justify the expense of improvement, that river is the Ohio. Still it is doubtful, if, under the present system, the benefits that will be derived from the completed improvement will justify the expense. Records will show that more than twenty millions of dollars have been spent by the government in improving the Ohio, considerable of which has been actually wasted on works of no value to navigation. To attain the results desired, to provide for continuous navigation, will require at least a further $85,000,000. But this will not provide for maintaining the improvement; and it is doubtful if it will cover the first cost, unless the methods are radically changed.

No one will question the great benefits to be derived from improved rivers, but we must keep the cost within reason or our improvements will become a burden. The Kanawha river is an example of improvements which will explain the point. It cost the government to improve the Kanawha more than $5,000,000, and it costs today more than $100,000 a year for operating and maintaining. This improvement provides 6 ft. navigation for 90 miles, the principal commerce being coal. Most of that coal is sent to Cincinnati, but it brings the same price as coal shipped by rail and as coal shipped from the Pittsburg district, although the coal from Pittsburg is towed about 300 miles farther. If the government charged enough toll on the Kanawha to merely meet the expenses of operating and maintaining, not considering the first cost of more than $5,000,000, the commerce would, no doubt, fall off to such an extent as to make the toll rates prohibitive. In 1909 (calendar year) only 1,035,401 tons were carried, of which 1,003,274 tons were coal and timber.

Do Not Justify Improvement.

Take the Muskingum, the Little Kanawha, the Big Sandy and its two forks, and the Kentucky; not one will ever justify the expense of improvement, unless the entire system is changed. How then can we expect the Ohio to justify an expenditure of more than $100,000,000 with an annual expenditure of at least $2,000,000 for operating and maintenance? We are losing sight of this operating expense in these improvements; an expense which will likely prove a burden in time unless taken care of by those who receive the direct benefits from the rivers.

The Ohio is 975 miles long; its waters wash six states; it flows through rich country—with much good farm land, many large iron and steel mills, large manufactories, etc. There are large deposits of coal along the banks of its tributaries. Such important cities as Pittsburg, Cincinnati, and Louisville are on its banks, not to mention Wheeling, Marietta, Parkersburg, Huntington, Covington, Madison, Evansville, Paducah, and Cairo. Should not the improvement of the Ohio be justified under such conditions? Still, consider the expense to be incurred to improve 975 miles of river, and the expense for maintaining such improvement. Consider that this work of improvement has been in progress for more than 80 years without appreciable results, and that more than twenty millions of dollars have been spent. Is it not time to call a halt—to inaugurate some new system for carrying on the work of improvement? We must have a change—results commensurate with the funds expended should be obtained or the work abandoned. There is no doubt that such results can be obtained, but not under present working conditions.

Adoption of Business Methods.

Business methods, methods that are recognized by first-class organizations, must be adopted. Every dollar spent should bring a like return in results. Men should be employed who are interested in the work. Plans for the structures should be standardized. Uniformity should rule. Work of improvement should be commenced at the source of the river and carried downstream step by step. The entire work should be under one managing head; in other words, it should be directed from a central office where all information relative to the river and its improvement should be available.

Today there are four separate offices in charge of the work on the Ohio, in addition to which there is a board of engineer officers. Not one of the offices has a complete record of the work done or in progress on the entire river. This is not business as carried on by successful concerns, nor can such methods bring results at reasonable cost. Think of it, the present system of improvement for the Ohio river was inaugurated in 1875 and actual construction work begun Aug. 19, 1878, on Dam No. 1, about five miles below Pittsburg. That structure was available for navigation in 1885. Twenty-four years later locks and dams (five) were built extending slack-water navigation a distance of about 30 miles below Pittsburg at a cost of more than $6,000,000. That is, it has cost the government more than $6,000,000 to provide slack-water navigation for a distance of 30 miles. And those works are not completed, although available. This amount does not include the cost of operating and maintaining the improvements—it represents first cost only. For operating and maintaining Dams Nos. 1-6 during the year ending June 30, 1909, it cost the government $119,954—part of the locks and dams were not available until late in that year.

New Method of Appropriating Funds.

If congress intends to provide for improving the Ohio river by canalization, it should adopt a new method of appropriating funds. In the first place, instead of providing funds for each lock and dam, yearly appropriations should be made for the entire river to be applied as directed by the chief of engineers, U. S. Army. The application of funds to dredging harbors, building dikes and embankments, etc., should be left entirely to the discretion of the chief of engineers. Today funds are being expended on works of improvement that will be unnecessary as soon as the locks and dams are available; in fact, some of those works will be entirely submerged and may then form obstructions. Congressmen are not conversant with the conditions—how can they be? Another uncalled for condition would be eliminated—the building of locks and dams for the benefit of certain cities, instead of for the benefit of general navigation. For example, slack-water navigation is available to Dam No. 6; Dam No. 8 is nearing completion but no provision has been made to build Dam No. 7. Of what benefit will Dam No. 8 be to navigation interests until Dam No. 7 is completed? Dam No. 11 is nearing completion, but it will take fully five years before Dams Nos. 9 and 10 are available. Had the work of canalizing been done systematically, slack-water navigation on the Ohio would have been extended to below Wheeling. This was designated as the worst stretch by the late Colonel Merrill.

Need of Central Office.

To carry on the work, a central office, with an experienced officer in

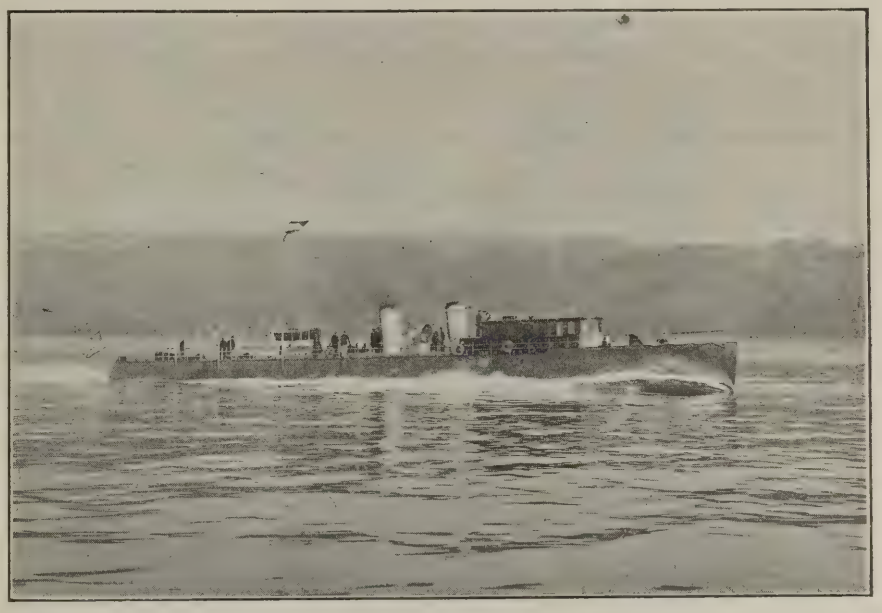
charge, should be established with branch offices conveniently located to the works under construction. The branch offices should be in charge of junior officers. A board consisting of the senior and the more experienced of the junior officers should consider and act on all plans for new work, and for the conduct of all work on the river. The senior officer should be relieved from all routine office work, so that he may devote his time to the more important executive and engineering work. To this end there should be a junior officer as secretary and disbursing officer.

A central office would reduce the number of clerks, draftsmen, and junior engineers required; it would permit the employment of capable engineers, mechanical engineers and draftsmen, and architects, the service of such men being badly needed; and it would insure uniformity in plans, specifications, and methods of construction. It would simplify the accounting both in Washington and in the district; it would reduce the amount of plant necessary; it would reduce the clerical work required in procuring land for lock sites; and it would reduce the expense necessary in procuring supplies, plant, material, etc. Furthermore, it would place this work on a business basis, which is absolutely necessary if tangible results are to be obtained.

THE TURBINE YACHT WINCHESTER.

The fast steam yacht Winchester, which has been built by Messrs. Yarrow & Co., of Glasgow, for P. W. Rouss, and is for his use on the Great Lakes, left Queenstown in tow on her passage across the Atlantic at the end of May.

The estimated speed of the Winchester was 26 knots, but the mean speed obtained on a two hours' trial was 26.7 knots. The dimensions of the vessel are: Length, 165 ft.; beam, 15 ft. 6 in. She is built on torpedo lines. The propelling machinery consists of three turbines of Parsons type, constructed by Messrs. Yarrow & Co., her builders, with three shafts, one propeller on each shaft. The port shaft is actuated by a high-pressure turbine, the center shaft by a low pressure turbine in which is incorporated an astern turbine, and the starboard shaft by a middle-pressure turbine. Steam to the turbines is supplied by two Yarrow water-tube boilers, constructed for burning oil fuel exclusively. The accommodation for the owner, which is below deck abaft the machinery space, and is very commodious and handsomely decorated, consists of a double stateroom, two single staterooms, drawing room, bath room, and toilet rooms. There is a teak deckhouse forward, 25 ft. long, containing



TURBINE YACHT WINCHESTER.

dining room, captain's cabin and pantry. The quarters for the officers and crew and the galley are below the main deck forward. The vessel has a complete electric light installation, and is heated by steam.

MOTORS ON THE HIGH SEAS.

Every day the possibilities of the oil motor for work on the high seas become more apparent, while the utility and reliability of the internal combustion motor for propelling sea-going ships have been placed beyond doubt. In this connection the cruise of Bolinders VII, round the coast of the British Isles has provided a very practical demonstration of the high level of efficiency attained by modern marine oil engines. The cruise was also made the occasion for an exhaustive trial of crude oil as motive power.

Bolinders VII is 60 ft. long by 19 ft. by 9 ft., and is fitted with a 80-B. H. P. Bolinders direct reversible crude oil engine. She started her cruise at the beginning of December, and had to brave the winter storms and weather. After touring the English and Bristol channels and the Irish coast, a trip was arranged from Queenstown to Londonderry. The Bolinders VII had previously made non-stop runs, on Russian petroleum, of such distances as 300, 500, 600, and 700 miles.

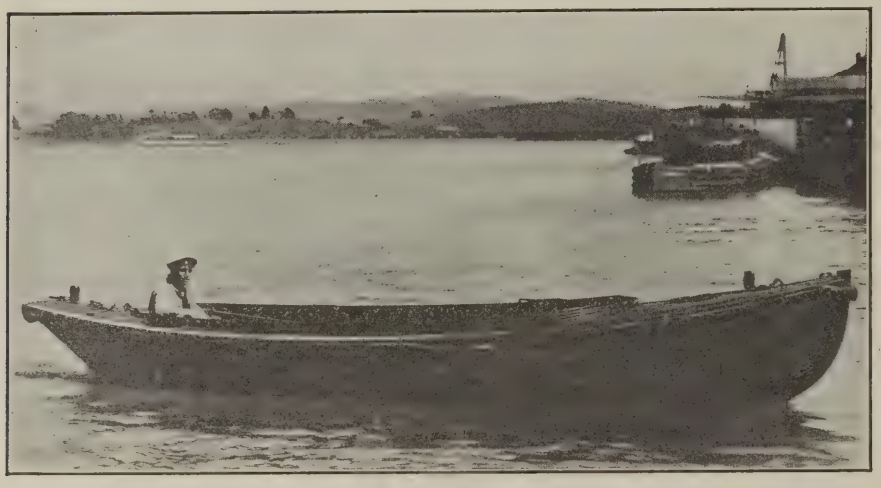
The trip from Queenstown to Londonderry was undertaken for the purpose of showing that a non-stop run of 400 miles was possible on Scotch shale oil fuel. At 2:30, on Tuesday, April 26, the Bolinders VII started on what turned out to be a very rough cruise. By midnight, Carnsore Point had been brought abeam, but, with a strong north-easterly wind springing up, progress was found to be laborious. The governor, however, fulfilled its purpose admirably by keeping the number of revolutions the same, whether the propeller was in or out of the water. At daybreak on Wednesday, the crew caught a glimpse of Wicklow, and by mid-day, Bolinders VII was well out at sea off Dublin, the Irish port at which she had caused such a sensation by her maneuvering powers. Steady progress was made from this time onward until Rathlin Island was reached, when a full hurricane was met, with the result that the last 40 miles of the trip were made under the worst possible conditions. Eventually Bolinders VII arrived at her moorings at Londonderry, where the crew took a real well-earned rest.

To ascertain the condition of the cylinders after this exhaustive trial, the covers were removed, and the deposit was found to be so slight as to be hardly worthy of mention. The distance of 400 miles was accomplished in 47 hours, and during the voyage, 160 gals. of Scotch shale fuel oil at 5 cents per gal. were used, giving 2.5 miles to the gallon. The cost of propulsion, therefore, works out at 2 cents a mile. Without doubt the time is not far distant when the crude oil engine will be a formidable opponent of the steam engine, on account of the fact that it requires less skilled attention, and allows a larger space to be devoted to carrying cargo.

The Navy Standard Motor Dory

By F. G. Coburn.

THE navy department has for some years been seeking a satisfactory type of motor boat, with which to equip the torpedo boat destroyers and larger torpedo boats of the navy. The necessity for these boats arises largely out of the long range torpedo practice now followed; it takes too much time to recover a torpedo after a 3,000 or 4,000-yard run, and then, too, there is sometimes the danger of losing the projectile unless picked up at once. As a torpedo costs $5,000, and has to be run a good many times before its individual idiosyncrasies are known and it becomes of military value, the loss of one would pay for a small fleet of motor boats.



United States Navy Standard Motor Dory.

As the torpedo flotillas require plenty of room for torpedo practice and maneuvering, their haunts are large bays and open roadsteads, where there is usually considerable sea, so that the boats must be very seaworthy. This requirement, combined with the hard usage the motor boats get, effectually rules out the ordinary type of motor boat affected for pleasure seeking. These boats, with their flat sterns and frail construction, were neither sufficiently seaworthy nor robust to fill the bill, and after several years' trial, have been abandoned.

The latest type, illustrated by the accompanying drawings and photographs, bids fair to solve the problem. The boat is of light weight, but of rugged construction. It is a regular dory type, cranky and wet, but will live in any sea, and except for the wetness, which may perhaps be relieved by slightly flaring the bows, is giving good satisfaction. Its general dimensions are as follows: Length of water line, 17 ft. 4 in.; length over all, 20 ft. 10 in.; beam on water line, 4 ft. 4 in.; beam, maximum, 5 ft. 7 in.; molded depth, 2 ft. 1½ in.; draught, maximum, 18 in.; weight, exclusive of passengers, 1,685 lbs.; capacity, 10 persons.

The foundations are of yellow bark oak; timbers, plank-sheers, clamps, etc., of white oak; planking of cedar; and interior finishings and deck of pine.

The boats were at first equipped with 4-H. P., single-cylinder, two-cycle engines, 800 R. P. M., with reverse gear; the propeller being three-bladed and of 14-in. diameter and 18-in. pitch. With this equipment the boat made five sea miles per hour, over a measured course, with a gasoline consumption of one-fifth gallon per mile. The boat has a gasoline tank of 35 gals. capacity. The last lot of six, built at Mare Island, is being equipped with 4-H. P., single-cylinder, four-cycle motors, 600 R. P. M., with reverse gear, with the same propeller; and as all these engines developed over 5 H. P. on test, a little more speed and ability are looked for. No data are at present available on their performance in service. As these last motors have the make and break ignition, it is probable they will prove more serviceable, as past experience in these motor boats has pretty well established the superiority of this type.

SUEZ CANAL REPORT.

The report of the Suez Canal Co. for 1909, which was submitted to the annual meeting of shareholders on June 6, states that the year's working results were highly satisfactory, owing to the general improvement in trade, more especially in the agricultural industry of India. For the first time since the opening of the waterway the receipts from shipping were over $24,000,000, the total amounting to $24,695,576, an increase of $2,397,374 over 1908. The expenses were $8,673,856, a reduction of $308,720, the surplus of receipts over expenditure being $16,020,170. After setting aside a sufficient sum for the statutory reserve, there remained a net balance of $15,577,318. Payment of a dividend at the rate of $30 per share, an increase of $1.80 on the rate for 1908, absorbed $15,100,000, leaving a balance of $8,100 to be carried forward. As a result of this increased prosperity, the transit dues are to be reduced 10 cents per ton from Jan. 1, 1911, when the impost will be $1.50 per ton, and it is hoped to lighten the burden on ship owners still further. During the year, 4,239 vessels of 15,407,527 tons net passed through the Canal, the increase over 1908 being 444 ships and 1,774,244 tons. Owing to an improvement in transit facilities, the average passage was reduced to 17 hours 13 minutes, and it is hoped that, as a result of the works now in progress, the time will be accelerated. In consequence of the rejection by the general assembly of the Board's proposals for a renewal of the Canal concession and of the continued opposition of the Egyptian Nationalists, all negotiations on the subject have been abandoned.

NEW HAMBURG-AMERICAN LINER.

Some particulars are now made known of the mammoth liner for the Hamburg-Amerika Co., which is now being built for the company by the Vulcan yard at Stettin. The vessel will have a length of 879.3 ft., a breadth of 95.2 ft. and a depth from the upper deck of 64 ft. She will register over 45,000 tons and will be propelled exclusively by turbines, giving her a maximum speed of 22 knots. The vessel will be larger than any vessel now built or building, and her size may be estimated by a comparison with the dimensions of the Cunard liner Mauretania, which are: Length, 761 ft. 2 in.; beam, 88 ft. 7 in.; depth from upper deck, 56 ft. 6 in., and tonnage, 32,500.

BRITISH CRUISER TRIALS.

The British protected cruiser Liverpool, built by Messrs. Vickers Sons & Maxim, of Barrow, who have also installed the engines, has completed her official trials with remarkable success. She attained a speed of 26.17 knots with an average of 24,700 shaft horsepower, as against the guaranteed speed of 25 knots and 22,000 shaft horsepower. She has been built and completed in 16 months from the laying of the keel. The Liverpool is 300 ft. long, 37 ft. broad, with 15 ft. 3 in. draught, and a displacement of 4,800 tons.

MARITIME LIEN LAW.

Congress has passed the maritime lien law, known as House Bill No. 15812. This measure relates to liens on vessels for repairs and supplies and will produce a considerable change in existing practice. The bill was drafted by a committee of the Maritime Law Association of the United States. It was adopted at a meeting of that association after a full discussion, and its adoption is also recommended by the American Bar Association.

This bill is proposed to remove the confusion now existing in an important branch of the admiralty jurisprudence of the United States by simplifying the law and making it uniform throughout the country.

Under the admiralty law, as now administered in the United States, a lien is implied for necessaries furnished a vessel in foreign ports or states, so-called; and for this purpose the various states of the Union are regarded as foreign to each other.

In the home state, so-called, a lien is not implied unless conferred by the local law. Home state has been identified with the state of ownership, and in the ports of the home state the vessel is said to be "domestic." In all other ports, even though they may be ports of other states of the United States, the vessel is termed a "foreign" vessel.

Most, if not all, of the maritime states of the United States have passed statutes providing liens for necessaries furnished to a vessel of the state—that is, to a so-called "domestic" vessel. But these statutes vary greatly in their scope and phraseology, and the task of construing them has been a heavy and unnecessary burden on the Federal courts, and has caused much confusion. For although the lien is conferred by a state statute, it can be enforced only in the courts of the United States, inasmuch as the subject matter is maritime, and hence, under the Constitution, within the exclusive jurisdiction of the Federal courts.

It has been stated by the Supreme Court of the United States, and is generally conceded, that the distinction made in this country between "foreign" and "domestic" vessels with respect to liens for necessaries is not only artificial but contrary to the law of maritime Europe (which makes no account of the domicile of the vessel) and to the theory of the English law. A contract for necessaries is maritime, whether made in the home port or in some other port, and as such does not depend upon the local law.

Along with this arbitrary division of American vessels into two classes there has developed in this country a doctrine which seems to have no counterpart in Europe, that when the owner of a vessel contracts in person for necessaries, or is present in port when they are ordered, no lien arises. The result has been much uncertainty in the administration of our admiralty law.

Under the Constitution of the United States the state legislatures cannot regulate the admiralty and maritime law of the United States. The power to do this rests with Congress alone. The state statutes have been enforced in the absence of congressional legislation, but the Supreme Court has recognized the right of Congress to deal with the matter of liens for necessaries, and it has been assumed that Congress would some day pass a law upon the subject.

The bill as passed is as follows:

"Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That any person furnishing repairs, supplies or other necessaries, including the use of drydock or marine railway to a vessel, whether foreign or domestic, upon the order of the owner or owners of such vessel, or of a person by him or them authorized, shall have a maritime lien on the vessel which may be enforced by a proceeding in rem, and it shall not be necessary to allege or prove that credit was given to the vessel.

"Section 2. That the following persons shall be presumed to have authority from the owner or owners to procure repairs, supplies and other necessaries for the vessel; the managing owner, ship's husband, master, or any person to whom the management of the vessel at the port of supply is untrusted. No person tortuously or unlawfully in possession or charge of a vessel shall have authority to bind the vessel.

"Sec. 3. That the officers and agents of a vessel specified in section 2 shall be taken to include such officers and agents when appointed by a charterer, by an owner pro hac vice, or by an agreed purchaser in possession of the vessel, but nothing in this act shall be construed to confer a lien when the furnisher knew, or by the exercise of reasonable diligence could have ascertained, that because of the terms of a charter party, agreement for sale of the vessel, or for any other reason, the person ordering the repairs, supplies or other necessaries was without authority to bind the vessel therefor.

"Sec. 4. That nothing in this act shall be construed to prevent a furnisher of repairs, supplies, or other necessaries from waiving his right to a lien at any time, by agreement or otherwise, and this act shall not be construed to affect the rules of law now existing either in regard to the right to proceed against a vessel for advances, or in regard to laches in the enforcement of liens on vessels, or in regard to the priority or rank of liens, or in regard to the right to proceed in personam.

"Section 5. That this act shall supercede the provisions of all state statutes conferring liens on vessels in so far as the same purport to creat rights of action to be enforced by proceedings in rem against vessels for repairs, supplies and other necessaries."

DEPRECIATION OF SAILING TONNAGE.

One of the English papers has made an interesting table, showing the rapid depreciation of sailing tonnage. During the first three months of 1910, about 30 sailing ships, a majority of them British, were sold. Norwegians, Germans and Italians have been the heaviest buyers, and a comparison of the prices shows how rapidly sail tonnage has depreciated in value. Since 1907, prices have been tumbling at a rapid pace and among the late sales not a few smart and well-found square-riggers have been sold for a mere song. The following table shows the large fleet recently disposed of and the price per gross ton indicates how low values have gone:

Vessel	Gross Tons.	Built.	Sold For.	Per Gross Ton.
JANUARY.				
Ladas	1,391	1894	£2,850	£2.03
Chelmsford	2,347	1893	4,900	2.08
Socotra	1,704	1891	3,300	1.94
MARCH.				
Scottish Glens	2,117	1885	*3,000	1.44
Sardomene	2,000	1882	2,800	1.48
Robert Duncan	2,166	1898	4,000	1.85
Este	1,420	1891	2,750	1.94
Balmoral	2,614	1892	5,250	2.00
Ben Dearg	2,349	1894	5,000	2.12
Forteviot	3,145	1891	6,500	2.08
Sokoto	2,262	1887	3,150	1.40
Ballachulish	1,901	1892	3,875	2.04
Clan Galbraith	2,149	1894	4,400	2.04
Pera	1,758	1890	3,350	1.90
Craigerne	1,905	1889	3.100	1.74
MacDiarmid	1,625	1883	2,400	1.48
Waterloo	1,976	1878	2,400	1.21
Pegasus	2,631	1884	3,500	1.31
APRIL.				
Blackbraes	2,207	1892	4,000	1.75
Craigmore	2,000	1895	4,250	2.125
Loudon Hill	2,139	1887	*3,100	1.45
Largo Bay	1,255	1878	1,500	1.115
Austrasia	2,718	1892	5,200	1.84
Corryvrechan	1,356	1885	2,150	1.59
Walden Abbey	1,799	1881	2,300	1.26
Wiscombe Park	2,229	1892	4,000	1.80
Crown of Germany	2,241	1892	4,150	1.85
Pass of Killicrankie	1,746	1893	3,375	1.96
Lodore	1,669	1892	2,300	1.39

*About.

The Spedden Shipbuilding Co., Baltimore, Md., began work on a steel tug 125 by 24½ ft., to be equipped with a triple-expansion engine and Scotch boiler.

Tarr & James, Essex, Mass., launched the whaler Viola for John A. Cooke, of Provincetown. This craft is about 123 ft. long, 25½ ft. beam, and 12 ft. deep. She will carry a crew of 23 men. This vessel was built under the rules of the Record of American and Foreign Shipping of the American Bureau of Shipping, and is rated A-1 for 15 years.

THE MARINE REVIEW

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THROWING MORE DUST.

Secretary of the navy Meyer is either the most persistent self-advertiser in public life or else he should pray for deliverance from his friends. A statement recently given out in Washington claims for him credit for economy in the use of coal which has been brought about by systematic firing, and economy of steam, replacing defective joints and journals and stopping leaky valves. On the Montana a saving of 15 tons of coal daily is claimed as being due to the systematic firing introduced by Secretary Meyer. With reference to oil, the saving has been as great. On the battleship Georgia, also, improved evaporators have reduced the cost of making fresh water 40 per cent. It is also claimed for the much advertised reorganization plans that they include the systematic overhauling of the vessels at the navy yards after each cruise, which permits the continuous employment of expert machinists, many of whom formerly would be dismissed after a piece of work was done and not be available when needed again; also that thousands of dollars have been saved in repair work by having repair shops on shipboard. Credit is also claimed for Secretary Meyer for the establishment of a school of marine engineering at Annapolis, wherein it is hoped to train for special work engineering officers who give promise of being of special value in that branch of the service.

There is just as much truth in the foregoing as in most of the reports that have emanated from the department since Secretary Meyer took charge. In 1905, at least four years before Mr. Meyer became secretary of the navy, the question of fuel economy was actively taken up and an expert civilian was sent with the battleship fleet to teach the so-called engineers the elements of proper firing in order that they might effectively supervise their own stoke holds. It will further be remembered that this question of competitive economy was a strong feature of the famous cruise around the world, from which all events in the navy are now dated. The congressional record of April 4, 1910, in the discussion on the naval bill, shows that as far back as 1905 an appropriation was recommended by the secretary of the navy for the employment of George H. Baker, of Brooklyn, N. Y., a civilian and an expert in the matter of economical boiler management, for the purpose of going aboard and cruising with the ships of the navy and giving instructions in firing and general boiler management, and both Mr. Foss, of the naval committee, and Admiral Evans testified to the value of Mr. Baker's services. The results of this instruction are what Mr. Meyer now seeks to appropriate the credit for. It was then asked on the floor of the house why it was necessary to employ a civilian in order to instruct the engineer corps how to fire boilers economically, and why the country was paying for the education of men at the naval academy if civilians had to be employed to carry on the work for which they were trained.

This competition in fuel economy, while desirable and praiseworthy, has led, in the hands of the present incompetent force, to some startling results. For instance, one chief engineer discontinued the use of his surface blows, giving as his reason that he did it to save water and coal, and that very shortly afterward a very serious explosion occurred in the boilers of this very ship with the loss of several lives as an inevitable result.

No one will deny the possibilities for oil economy. We have heretofore drawn attention to the oceans of oil reported as used on the machinery of naval ships, reports which actual observation have proved to be fully confirmed. The discovery of an evaporator which has reduced the cost of making fresh water 40 per cent will come to the engineering world as news of the first importance. Probably, however, the facts of the matter are merely that the cost of making fresh water for the navy has been reduced 40 per cent, which is a very different thing. As to the systematic overhauling of vessels, there has been no change whatever from the old

methods. The cruiser fleet comes in for overhauling and when it goes, a large number of men have to be discharged. Some of the work is, of course, done by the ship's force, as has always been the rule. We have had opportunity to see some of it and of this subject the less said the better.

The statement that thousands of dollars have been saved in repair work by having repair shops on shipboard is merely moonshine. The policy in this respect has not been changed in the slightest degree under the present administration. Long before Secretary Meyer began rattling around in the navy department each ship was fitted with a small shop and these ships still have their shops and no others.

The credit that is claimed for the new administration for training men in marine engineering is the most amusing of all. When Chief Constructor Capps was made active chief of the bureau of marine engineering by Secretary Newberry, he immediately brought this subject to the latter's attention and outlined a course of three years at the Massachusetts Institute of Technology. His recommendation was approved by Mr. Newberry and a general order was issued for the establishment of the school and officers were invited to make requests for detail. Very shortly after this Mr. Newberry went out of office. Mr. Capps' plan is being carried out absolutely except that the location of the school was changed from an outside institution to the naval academy, which progressive naval officers consider to be a mistake, for the reason that not only would the instruction at Boston have been very much better, but the officers detailed would have rubbed shoulders with the outside world, and this experience, of which they stand in sad need, would have been of great value.

So long as the navy is dominated by Secretary Meyer or others of his type it will fall short of fulfilling the ideals of what a navy should be.

FOREIGN SHIPPING INTERESTS AND THE ASSOCIATED PRESS.

If the Merchant Marine League investigation has done nothing else, it has opened wide the eyes of the reading public as to the lengths and reaches that the foreign shipping interests will go to mold, influence, direct and control American shipping. The fact that it had on its pay roll one of the managers of the Associated Press in Washington was as electrifying and illuminating as a flash of lightning across a dark sky. It was not expected that it would seek to mold public opinion right at its fountain head; yet it is so. How much information of a character hostile to American shipping interests has been disseminated through this agency during the past ten years; how much information of a character favorable to American shipping interests has been withheld and suppressed during the past ten years must be left to one's imagination. It certainly throws much light upon a fact, hitherto puzzling, that the Associated Press was carrying so little in its columns from day to day of the Merchant Marine League inquiry. It appeared as though the activities of the Associated Press were growing less as the cause of American shipping grew stronger.

It came as a shock to the unsophisticated public that for the past ten years Jerome J. Wilbur, who has been for 25 years connected with the Associated Press in Washington and at present assigned to the State War and Navy Building, had been in the employ of two leading foreign steamship companies, the Hamburg-American Line and the North German Lloyd Steamship Co. Mr. Wilbur was reluctant to state what his compensation was, but Mr. Emil Boas, managing director of the Hamburg-American Line, stated that it was $3,000 per annum, of which sum one-half was contributed by his company and the other half by the North German Lloyd.

Apparently the Associated Press has something of that philosophy commonly credited to France, that crime consists solely in being found out, for the officers of that concern immediately issued a statement that Mr. Wilbur's resignation had been tendered and accepted. For ten long years the Associated Press knew of its representative's connection with foreign shipping interests; but it could not rest under the publicity of this indictment for ten minutes. John P. Gavitt, the Washington manager of the Associated Press, rushed before the committee without a summons to say that he knew and approved of Wilbur's employment by the foreign shipping interests, but did not believe that such connection affected the reliability of the news service. Then the Associated Press followed it up with a statement saying that it having come to the knowledge of the officers of the Associated Press that such a connection existed they had requested Wilbur's resignation, not that he had done anything wrong, but that the knowledge of such connection impaired his usefulness. Doubtless it impaired his usefulness as an impartial collector and distributor of news, but not more so now than ten years ago. The Associated Press certainly does not come out of this affair unscathed.

Coincident with these disclosures came a remarkable speech from Congressman Humphrey, in which he declared that the North German Lloyd in 1898 voluntarily withdrew from its merchant service two of its fastest and best steamships and sold them to Spain for the purpose of preying upon American commerce on the seas, the self-same company that for a dozen years has been carrying a Washington representative of the Associated Press on its pay roll. Did the Associated Press pay any attention to this sensational disclosure of Congressman Humphrey? Not a line of it was carried.

TAKE THE POLITICS OUT OF THE DEEP WATERWAYS MOVEMENT.

In the June issue of THE MARINE REVIEW we urged adoption of sane engineering and business methods in dealing with the deep waterways projects of the middle west, and pointed out that it is only through the use of these methods that the waterways propaganda can be expected to make any permanent headway.

A pointed example of the wrong way of handling this matter—making it a subject for political jugglery—is

shown in the following news dispatch relative to the methods being followed by some Illinois "statesmen" in the appointment of an engineer for the Deep Waterway Board. The dispatch is quoted from the June 21 issue of the Chicago *Tribune*:

"Isham Randolph may be appointed instead of Lyman E. Cooley, to the board of engineers which is to study the feasibility of the deep waterway project so far as it pertains to the Desplaines and Illinois rivers. President Taft has his name under consideration.

"Senators Cullom and Stone of Missouri, and Representatives Graff, Lundin, Madden, and Lowden called on the president this morning and urged the appointment of Cooley, who was slated originally for a position on the engineers board by Senator Lorimer. Mr. Cooley was the engineer who appeared before the senate and house committees urging the appropriations for the Lorimer deep waterway plan. He was retained for this purpose by waterway interests represented by Senator Lorimer.

"As a result of the efforts of Lorimer and his friends, the river and harbor bill carried a provision appropriating $1,000,000 for preliminary work on Desplaines and Illinois rivers in connection with the waterway project, and directing an investigation of its feasibility by two army engineers and one civil engineer from private life. This provision was so framed as to permit the appointment of Cooley.

"It is understood that the president wants to appoint to this board engineers whose minds are unbiased on the waterway project. Mr. Cooley demonstrated, in his arguments before the congressional committees, that his conviction of the feasibility of the Lorimer plan already is deep rooted.

"If the appointment of Cooley is refused by the president, the Lorimer following will object strenuously to Randolph, on the ground that he is committed to the Deneen 9-ft. waterway and opposed to the Lorimer 14-ft. project."

With all due respect we may state that neither Gov. Deneen nor Senator Lorimer are competent to pass on the internal waterways problems of the State of Illinois, and their attitude in this matter is simply blocking the progress of real development for the benefit of navigation and commerce and turning responsible and sensible citizens away from the internal waterways movement in disgust. Deneen for political reasons may favor a 9-ft. channel on the Desplaines and Illinois rivers and Lorimer for similar reasons a 14-ft. channel, and neither of these contentions is based on an unbiased expert study of the commercial and engineering features of the situation. Just so long as the waterways propaganda is used mainly for political capital by irresponsible politicians, the community may expect no beneficial results. The whole business is parallel to the wildcat railroad projects indulged in by many western states 50 years ago, and the fate of those projects is too well known to need comment.

The attempt of the Illinois politicians to get a partisan engineer appointed to their western board is of course only evidence that politics is the uppermost consideration. It is refreshing to note that President Taft wants to appoint an unbiased board of engineers. It appears that the president has a better appreciation of the needs of the people of Illinois than have the governor and senator of that sovereign state.

The waterways problems of the middle west are problems of vast importance and have intimate bearing on the welfare of the Mississippi Valley. It is to be hoped that their solutions will not be left to politicians who have no interests in the question other than selfish ones.

CONGRESSMAN LOUD AND THE NAVAL WASTE.

The Hon. George A. Loud, member of congress from the tenth district of Michigan, is one of the most solid men in the house of representatives. Let that be put to his credit. He is deeply interested in the cause of the merchant marine and is moreover deeply interested in the navy. That is most natural, as he is a member of the committee on naval affairs. It is therefore natural that he should have been somewhat disturbed over the revelations made in the Naval Waste series of articles recently published in THE MARINE REVIEW. The pity of it is, however, that instead of analyzing the revelations made in that series and passing upon them in a calm and judicial manner as becomes a member of a legislative body, he sweeps them aside as so many misstatements of facts. It is surprising that he should do so. There are no misstatements of fact in the series.

As is well known, this series was published in pamphlet form and it is this pamphlet which has aroused Mr. Loud's ire. In a letter he states that he has given the pamphlet careful consideration. It appears to us that he has really given it careless consideration. To begin with, he says that no such amount as $7,000,000 has ever been used for four colliers. The Naval Waste never said that it had. It simply stated that $7,000,000 was asked for the construction of four colliers. The Department estimates will bear up the correctness of that statement.

Mr. Loud admits that the colliers Vestal and Prometheus could have been built in private yards for $1,200,000 each or less, but adds that the extra cost involved was due to the "perhaps needless extra speed of 16 knots per hour and the cabins and accommodations for transport service." These two colliers cost $3,136,492. There is no provision whatever in their construction for transport service, as Mr. Loud intimates. Their excessive cost is due partly to navy yard construction, but chiefly, let us be candid, to fool design. Nothing more foolish in the way of a coal carrier was ever constructed. Fourteen knots is too fast for any bulk freighter; 16 knots is simply silly. There was not a collier in the squad that served the fleet in its trip around the world that could even make 12 knots continuously. The Vestal and Prometheus, if loaded to full capacity, say at Hampton Roads,

could not deliver a single ton of coal at Puget Sound at trial speed. They would burn up all the coal that could possibly be stowed in the bunkers and cargo holds to get them there at that speed.

Mr. Loud states that the two colliers of the Cyclops class are his ideal of what naval colliers should be. Well, the Cyclops, for which Mr. Loud is in a measure responsible, is a more sensible collier than either the Prometheus or Vestal, but nevertheless, if loaded to her full capacity, which, including bunkers, is 12,500 tons, she could only deliver 5,000 tons at Puget Sound at trial speed of 14 knots. Her contract price is $822,500. If reduced to 12 knots she would not only cost far less, but would carry more and would deliver over 7,000 tons at Puget Sound.

The colliers Mars, Vulcan and Hector are by far the most business-like colliers that the navy owns. All three of them put together were built for less money than either the Vestal or Prometheus, while their combined carrying capacity is 80 per cent greater than the combined carrying capacities of the Vestal and Prometheus. They were built by the Maryland Steel Co. and the Navy Department had nothing whatever to do with their design. Naval colliers cannot transport a ton of coal at a cost of less than two to five times what it can be done for in merchant ships—and this, too, with the merchant ship paying 4 per cent insurance charge and interest and depreciation and maintenance and overhead charges which a naval ship is free from.

Mr. Loud is also disturbed because the Naval Waste stated that the Prometheus and Vestal were five years in building. He calls that another misstatement. The Vestal and Prometheus were authorized in April, 1904. The Vestal went into commission Oct. 4, 1909, and the Prometheus Jan. 15, 1910. It is not difficult to figure five years in the interim. To be sure the keel of the Vestal was laid on March 26, 1907, and the Prometheus on Nov. 6, 1907, but that is neither here nor there. The time of building a ship dates from the time she is taken in hand or the contract signed. The drawings and specifications for these ships were sent out in January, 1905, and were therefore prepared before that date, as Mr. Loud can very readily discover, if he will but read the department reports. There is no misstatement in the fact that it took five years to build these two colliers. Mr. Loud apparently is not posted. On the lakes we built a ship in forty-five working days from the laying of her keel, but the material had doubtless been in process of fabrication and assembly for months before.

WATER CONSUMPTION OF ENGINE ROOM AND DECK AUXILIARIES.

The amount of steam consumed, or rather wasted, by auxiliary machinery aboard ship has always been a vexatious problem for the naval architect. The weight of steam required for the propelling engine can be calculated and provided for with a reasonable degree of accuracy, but the amount required for other purposes is a very large factor in the boiler capacity to be supplied and varies largely even between similar ships. Probably the most elaborate and painstaking investigation of this subject, at least in American practice, was that of the main and auxiliary machinery of the U. S. S. Minneapolis by Passed Assistant Engineer W. W. White, of the United States navy, and reported in volume 10, 1898, of the Journal of the American Society of Naval Engineers, and which has been a standard reference since.

Another paper on the same subject was recently read before the Institution of Engineers and Ship Builders in Scotland, by C. F. A. Fyfe and, while the results noted are to be regarded only as approximations, still they are of value as a check on other figures. The paper contains the results of a number of tests with auxiliary steam machinery under varying conditions. The water measurements were obtained by observing the fall of the water level in the boiler gage-glass, with the feeds shut off, while at the same time the water of condensation in the steam pipes was collected in a drain tank and measured. The results were plotted and consumption curves drawn. It was found that in the majority of cases the water actually evaporated bore a fairly uniform percentage in excess of the calculated weight of steam passing through the cylinders of the auxiliaries, and what variations occurred were generally easily accounted for. Where less steam than was anticipated was used, superheating or wire-drawing had probably been the cause.

It was found that careful handling of winches made a very great difference in the consumption, one operator using in some cases as much as 55 per cent more steam than another, the conditions being otherwise alike in both cases. For instance, a winch with 9 x 2-in. cylinders required, when carelessly driven, 2,790 lb. of water per hour, but when properly driven, 1,930 lb. per hour. Again, one with cylinders 6 x 10-in. consumed 1,040 lb. per hour when operated carelessly, and, when properly handled, 722 lb. per hour. The weather was also found to make a very considerable difference in the steam consumption, since in hot weather there is naturally less condensation in the cylinders and pipes. The conditions affecting the consumption of steam by auxiliaries at sea are, of course, different from those in port, and the auxiliaries themselves are different. It must not be assumed, therefore, that the consumption when in port is much of a guide to the consumption at sea, and weather conditions affect the results less in the latter case. In trials carried out at sea, the consumption of the usual auxiliaries, including feed-pump, ash-ejector, circulating pumps, ballast pump, sanitary and bath-pump, refrigerating machine and pumps, electric engine, steering engine, etc., appears to be, on modern, well-equipped steamers, about 15 or 16 per cent of the total amount consumed.

STEAMSHIP CREOLE'S PERFORMANCE.

Editor MARINE REVIEW:—It will probably interest the readers of your valued paper to know that the S. S. Creole is again in service after having been fitted with reciprocating engines to replace Curtis marine turbines as

originally installed by the builders of the vessel.

The vessel sailed from this port on May 25 in our regular passenger service between New York and New Orleans, and arrived at South Pass, mouth of Mississippi river, at 7:58 p. m., May 29; 6 hours ahead of schedule. On the return trip the vessel sailed from New Orleans on June 1 at 10:10 a. m. and arrived in New York at 3 p. m., June 5; 16 hours ahead of schedule and breaking all north bound records between the two ports. The run south bound, bar to bar, was made in 103 hrs. 15 min., despite the fact that the vessel lost 2 hrs. 45 min. between Scotland Light and Diamond Shoal on account of being operated at reduced speed in dense fog. The run north bound, bar to bar, was made in 92 hrs. 20 min. The average speed over the bottom, bar to bar both ways, was 16.55 knots per hour.

The vessel's new machinery equipment consists of two vertical, inverted, direct-acting, triple-expansion, surface-condensing engines with cylinders 27¾, 46½, and 79-in. diameter by 42-in. stroke, designed for 95 revolutions at 16 knots.

The vessel's boiler equipment is the same as originally installed, i. e.: ten Babcock & Wilcox large tube type marine boilers carrying a working pressure of 210 lbs. above atmosphere with 50 degrees Fahr. superheat.

The vessel was operated with the usual complement of men in the deck and engine departments taken from our regular service.

A. S. HEBBLE,
Superintending Engineer.

REMOVING SCALE BY PIECE-WORK.

Editor MARINE REVIEW: — We are much interested in an article in your issue of June, 1910, page 222, on removing scale under the piece-work system.

There is one point in this article, however, which is not clearly set forth, and that is, how the berths for piece-workers are laid out on the side of the ship.

Of course, we understand that a berth amidships comprises a considerably greater area per longitudinal foot than a berth at the bow or stern.

We would be glad to know the method, therefore, by which these berths are laid out, and would greatly appreciate any information you could give on this point. SHIP BUILDER.

Philadelphia,
June 20, 1910.

The author of the article supplies the following information:

When scaling by piece work was first undertaken the berths for the men were laid off by long battens and chalk lines run in. Later on, however, this was abandoned for it was found that for all practical purposes the following more simple method was satisfactory. For work on the outside hull, the staging tackles are hung 18 ft. apart starting at the bow, thus dividing the body of the ship into 18-ft. divisions. Each workman is given a section and all try to complete their sections down to the staging at about the same time in order that the whole staging may be lowered at once. As the time consumed in handling the staging comes out of the workmen's pockets it can readily be seen that it is to their advantage to have all lines ready to lower the staging together. Each man retains his section down to the keel. Whenever two workmen desire to work together in partnership and take the two adjacent sections, this is allowed, the earnings being divided. At 8 a. m. each day the work of the previous day is carefully measured up by means of a tape and the work that has been accomplished is lined off with blue paint. The date is placed in the space together with the workman's initials. In this way any of the work which fails to pass inspection can be readily traced to the proper workman.

On interior work the men nearly always work in pairs and divide their earnings so that there will be two men available to handle the staging.

PLANNING NEW TONNAGE.

Editor MARINE REVIEW:—The vessel owner who lets a contract for the construction of new tonnage without properly prepared plans is to be compared to the mariner who starts on a voyage without chart or compass. He may reach his contemplated destination, but it will be after circuitous wanderings and many anxious and expensive delays. As a study of, or a glance at the chart may show the navigator that his ultimate destination is not where he expected or possibly does not exist at all, so carefully prepared plans often develop hidden defects in proposed schemes that are in fact impracticable from a commercially successful point of view. Every new vessel should be an improvement on former ones, and it is the duty of the enterprising and painstaking consulting naval architect to profit by the experience of himself and others in what is already afloat, and thereby improve on his "ship on paper," eliminating all of the undesirable features of design and construction that he has knowledge of in former vessels.

In no manner or place is this so well done as on the drawing board in the drafting room. Working out ideas on steel hulls and on wood in cabins is an expensive operation, and it is so much easier and cheaper to draw and erase lines, and work out details on paper by the naval architect, than it is to employ gangs of fitters and platers, changing structural steel work, and joiners tearing down and changing woodwork after it has been erected, fitted and found unsatisfactory. A good set of plans shows the owner precisely what he wants, and enables him to get a close estimate on probable cost of vessel. They also show the intelligent artisan how to arrange the scantling and assemble the various component parts in the strongest and most economical manner, resulting in the maximum of strength with the minimum weight.

The naval architect in submitting a proposition to prospective vessel owners to make plans and specifications for their new tonnage, is frequently met with the remark that the builder or contractor will furnish the plans free. The owner who expects to save money on plans does not realize that although the builders maintain a permanent staff of draftsmen, that they are not in business for their health or pleasure and must meet that annual expense some way.

Their usual practice is to embody in the estimates before submitting bid for new work, a sum in amount equal to from 5 to 7 per cent of total cost of vessel for plans. But apart from the consideration of the owner paying the bill and not knowing it, there are certain distinct disadvantages which we will notice in order.

In the first place, he is paying more for the plans than he should, if he engaged a consulting naval architect, who would also superintend the work on his behalf. Further, the plans prepared in ship yards are got out by young men of little experience under the direction of the contractors' chief draftsman. The latter gentleman, though frequently a very competent man in his line, has to divide his time and attention to several different classes or designs of vessels under way at the same time and may not be posted on the complete and perfect requirements of any one of them. Whereas, the vessel owner's consulting naval architect makes a special study of the requirements of the trade and route of each vessel he designs, sometimes

taking trips on the route to note conditions and needs, locally and otherwise. Much slipshod and careless work is done by some builders when building to their own plans and unless duplicating a boat for an owner already well satisfied some of them cannot always be trusted.

A case could be cited where a vessel had to have $35,000 expended on her after one season's run, and had not met with an accident either. Her inefficiency was due to incompetent design in hull and working details; she was later sold after a few seasons' service for about one-third of her original cost. Still another vessel had to have expended on her one-third of her cost in changes during her second season; this was also due entirely to faulty design. Another case which must still be fresh in the memory of marine men is that in which a vessel owning firm sued the builders for over a quarter million dollars for defects due to the errors of the builders' chief hull draftsman.

We could cite nearly a dozen cases where vessels have gone into commission this year on the great lakes and have been the cause of annoyance, delay, expense and discussion, between the builders and owners, and in each and every case the trouble can be traced to faulty, incompetent or careless designing. A naval architect recently stated that he was kept busier by owners in changing and overhauling "botched" jobs on vessels, than in designing new tonnage.

W. J. W.

July 5, 1910.

Excursion On New Steamer Alabama

ABOUT 200 prominent business men from Chicago and vicinity were tendered an excursion on Lake Michigan as the guests of the Goodrich Transit Co., Wednesday afternoon, June 30. The event was in the nature of a "house warming" for the new steel steamer Alabama recently added to the Goodrich fleet. The steamer left her dock at the foot of Michigan avenue at 1:30 for a cruise in the lake and returned at 5:00 p. m. No attempt at a trial of speed was made, although one brief spurt was indulged in to show the visitors what the new boat could do.

Albert W. Goodrich, president of the Goodrich Transit Co., and H. W. Thorp, general manager, were the hosts of the occasion. Many prominent in marine and transportation circles on Lake Michigan were among the guests, as well as a number of well known business men from Chicago and representatives of the city government. Light refreshments were served. At the conclusion of the trip Messrs. Goodrich and Thorp were fairly overwhelmed with congratulations and toasts were proposed in honor of the good ship Alabama.

A complete description of the Alabama with drawings will be published in the August issue of THE MARINE REVIEW. The steamer is one of the most sumptuously and tastefully furnished vessels on the lakes. She was designed

THE GOODRICH TRANSIT CO.'S NEW STEAMER ALABAMA.

for the summer passenger trade on Lake Michigan and is admirably adapted to that purpose. At present she is operating on the night run between Chicago and Muskegon, Michigan.

Her hull is 271 ft. 6 in. in length over all, 44 ft. molded beam and 27 ft. in depth to the spar deck. The total depth from top deck to keel is 54 ft. Her loaded draught is 9 ft. 9 in. forward and 12 ft. 9 in. aft.

The Alabama is of the spar deck class with four decks as follows: A boat deck, promenade deck, cabin or spar deck and main deck, the two former of wood and the two latter of steel.

Provision is made for 272 passengers in 136 two-berth rooms. The excursion capacity is 1,500 passengers. Forward on the boat deck and just abaft the bridge are a number of parlors fitted with large brass beds, couches and furniture similar to that in the rooms of a first class hotel. A roomy bath room is attached to each parlor.

The smoking room and bar, on the boat deck aft, are finished in weathered oak with brown leather upholstery.

Aft on the spar deck is the social hall or main cabin, exquisitely finished in mahogany and furnished with roomy leather-bottom chairs and settees. The cafe is forward on this same deck. A grand stairway, wide and easy, connects the gangway opening on to the main deck aft, with the social hall. The floors are covered with cork matting throughout.

The steamer is fitted with a triple-expansion engine with cylinders 23, 38 and 62 in. in diameter by 36-in. stroke, which at 120 r. p. m. develops 2,200 i. h. p. with 180 lbs. boiler pressure. It was built by the Toledo Shipbuilding Co., Toledo, O. The engine drives a four-bladed sectional propeller, 12 ft. diameter.

Steam is supplied by three Scotch boilers, each 11 ft. long and 12 ft. 6 in. in diameter with 2,020 sq. ft. of heating surface.

The Alabama was built by the Manitowoc Dry Dock Co., Manitowoc, Wis., and everywhere throughout the vessel is evidence of careful design, thoughtful execution and tasteful finish. The finish and furnishings are rich, but do not descend to the gaudy barbarous gilt and ginger-bread work found on so many passenger vessels. Her normal speed is 17 statute miles per hour. She is in command of Capt. Edward Taylor.

The new 5,000-ton steamer Ruth, owned by A. H. Bull & Co., of New York, was launched on June 11 from the Newport News ship yard. She will be used in trade between both Atlantic and Gulf of Mexico ports.

LLOYDS REGISTER OF AMERICAN YACHTS FOR 1910.

The American Yacht Register, which makes its appearance for the eighth successive year, is unchanged in exterior from last year, but an inspection of its various departments discloses good grounds for the claim of the publishers that it is necessary to make the book entirely anew every year. The changes in the 3,500 entries of the Yacht List proper show a complete reorganization of the American pleasure fleet on a new basis; the gasoline engine displacing rope and canvas more rapidly than in any previous year.

With but three new additions to the sailing fleet, A. S. Cochran's big schooner Westward, Harold S. Vanderbilt's small schooner Vagrants and Morton F. Plant's 53-ft. cutter Shimna, there are to be noted such omissions as the famous cup-defenders Volunteer and Vigilant, sold for commercial service, the well-known schooner Thistle, sold to a foreign owner, a number of the less noted schooners and cutters, sold out of yachting or broken up. Of those of the older and larger still left, the great majority are now auxiliaries. The additions to the sailing fleet are so few in number as to call for no special mention, mostly racing boats of not over 35-ft. load waterline.

The new auxiliary barque Aloha, 218 ft. over all, with a gross tonnage of 659, stands alone among the new yachts of the year; next in importance to her in the way of additions to the list are the cruising power yachts of 80 to 100 ft., some of steel and some of wood, and all of a type which combines good cruising speed with sea-going qualities. Several of these vessels are of the familiar American type of coasting steam yacht, with flush deck and stack and spars, but they are driven by gas engines instead of steam. In this connection, another interesting change is to be noted: The removal of steam engines, boilers and bunkers from some of the older steam yachts and the substitution of gas engines.

An entirely new type that is found in the *Register* this year for the first time is the ocean cruiser of about 60 ft. length, the product of the long distance races of recent years to Bermuda and Havana. This type is represented by the Caliph, Berneyo, Loantaka; all new this year and specially designed for this service.

The most numerous additions to the Yacht List are found in the new type of raised-deck power cruisers of from 30 to 60 ft. over all; geographically, these additions are scattered over the whole country, on the Canadian and American sides of the St. Lawrence river and the Great Lakes, and on both borders of Puget Sound; further down on the Pacific coast; on the Gulf of Mexico, Houston, for instance, boasting a very fine fleet of new cruisers, and, of course, in the older yachting waters of the east. The smaller craft of this type are also found in great numbers on the inland waters of the middle west.

Of purely racing types the majority are found in such small sailing yachts as the Sonder-class and the Seawanhaka cup class, and in the 40-ft. class of full-powered launches. The well known yachts that will be missed from the *Register* this year are W. K. Vanderbilt's Valiant and A. J. Drexel's Margarita, both sold to foreign ownership.

One notable feature is the increase in the number of clubs, the total being 458, as compared with the 159 clubs in the 1905 *Register.* This increase is made up in part of the conventional yacht clubs, but largely of clubs specially devoted to power yachting, the membership being composed of new recruits to the great American pleasure navy. The increase is confined to no one locality, it is marked in the inland and lake waters of Canada, as well as on both fresh and salt water in the States. The commercial value of this side of yachting, as represented in engine building and allied industries, cannot be estimated.

The incidental feature of the book includes the usual List of Yacht Owners, the flags in colors of all of the clubs and of 2,047 individual yachtsmen, signal letters carried by yachts, etc.

The book, which includes 456 printed pages and 48 colored plates, each 7 x 9 inches, is made up as last year in two styles, bound in blue cloth with gilt edges and back and owner's name in gold on the cover; and in plain canvas; the former is used on the larger yachts and the clubs, while the cheaper and plainer edition is preferred for the rougher use on small cruising yachts. It is published by Lloyds Register of American Yachts, 17 Battery place, New York.

Bids have been received by the Chesapeake Steamship Co. for the construction of two steamers to be known as the City of Baltimore and the City of Norfolk, to be 310 ft. long over all, 46 ft. beam.

The Newport News Shipbuilding & Dry Dock Co., Newport News, Va., was the lowest bidder for constructing the steamer North Land for the Norfolk & Washington Steamboat Co.

The White Star Line's profit last year was $3,070,270. A dividend of 10 per cent was declared and a bonus of a similar amount paid to the shareholders.

THE STEAMER JAMES H. HOYT, LEAVING THE SUPERIOR SHIP YARD AFTER BEING LENGTHENED.

STEAMER JAMES H. HOYT LENGTHENED.

The steamer James H. Hoyt, which stranded on Outer Island, Lake Superior, last fall, is practically a new ship, having been lengthened 48 ft. as well as undergoing complete interior rebuilding, substituting the arch construction in place of the main deck beams and hold stanchions. The sheer strake and spar deck were strengthened by putting a doubling plate two-thirds the length of the ship. Seventy-six plates were taken off the bottom and about 175 bottom frames were cut and straightened. The whole tank top was also taken off, rerolled and put back. The tank top stiffeners were reinforced with plate. The intermediate stiffeners were also reinforced to resist the abuse which the tank top receives from the unloading machines. Considerable repairs were also made to the machinery and boilers on account of the stranding, and altogether the James H. Hoyt, the first vessel on the lakes to be constructed with hatches spaced 12 ft. centers, is a new ship.

SAN JUAN NAVIGATION CO.

The San Juan Navigation Co., the newly organized steamship company, has inaugurated the first daylight service from Seattle to the San Juan Islands in upper Puget Sound. The company has purchased the Burton from the Kitsap County Transportation Co., and will run her under the command of Capt. Chas. Basford, formerly master of the Islander. A long charter has been taken on the steamer Vashonian, owned by the Vashon Steamship Co., the Vashonian being in command of Capt. E. B. Jackson, formerly of the Kitsap County Transportation Co. The new company has been organized to meet the demand for a transportation concern to handle the mail contract in the San Juan Islands. George V. Hind, of Hind, Ralph & Co., the San Francisco shipping concern, is president of the new company; A. E. Black is vice president; and C. G. Coker, of the Diamond Coal Co. is general manager. The Burton will run from Bellingham to the San Juan Islands and return, while the Vashonian will make all points between Seattle and East Sound, connecting with the Burton at Friday Harbor.

NEW STEAMER C. A. JAQUES.

The new St. Lawrence and Upper Lake package freighter C. A. Jaques, arrived at Montreal on Sunday, May 26, after a remarkably short passage from the Clyde of 12½ days. This vessel is one of the most up-to-date of the Canadian canal type of freighter of the usual lock dimensions with deep 'tween decks, gangway doors, and friction shafting for rapid handling of cargo. She is fitted with triple-expansion engines with cylinders 18, 28, 46 by 33 in. stroke, and two Scotch boilers fitted with forced draft

on the Howden system. The vessel was designed and its construction supervised by Messrs. John Reid & Co., of Montreal and Glasgow. It will be employed by its owners, Messrs. Jaques Co., of Montreal, in their package freight trade between Montreal and Fort William.

A NEW STEAM-VALVE-LESS PUMP.

The line engravings herewith show in section the steam end of a unique design of duplex steam pump, of which a full line has been brought out by the Manistee Iron Works, Manistee, Mich., for all purposes.

In this design, steam valves and stems, rockers, links and all other gear are dispensed with, the steam pistons only remaining as moving parts.

In Fig. 1, the ports *AA* are steam ports; *CC* are exhaust ports, and *BB* and *DD* are alternately steam and exhaust ports.

The cylinders are cast together and the ports are V-shaped in section so as to give in effect a graduated opening as they are uncovered by the pistons.

Fig. 1 shows the pistons in four different positions and it will be evident on inspection that the pistons must complete their strokes before the ports can change from steam to exhaust and *vice versa*.

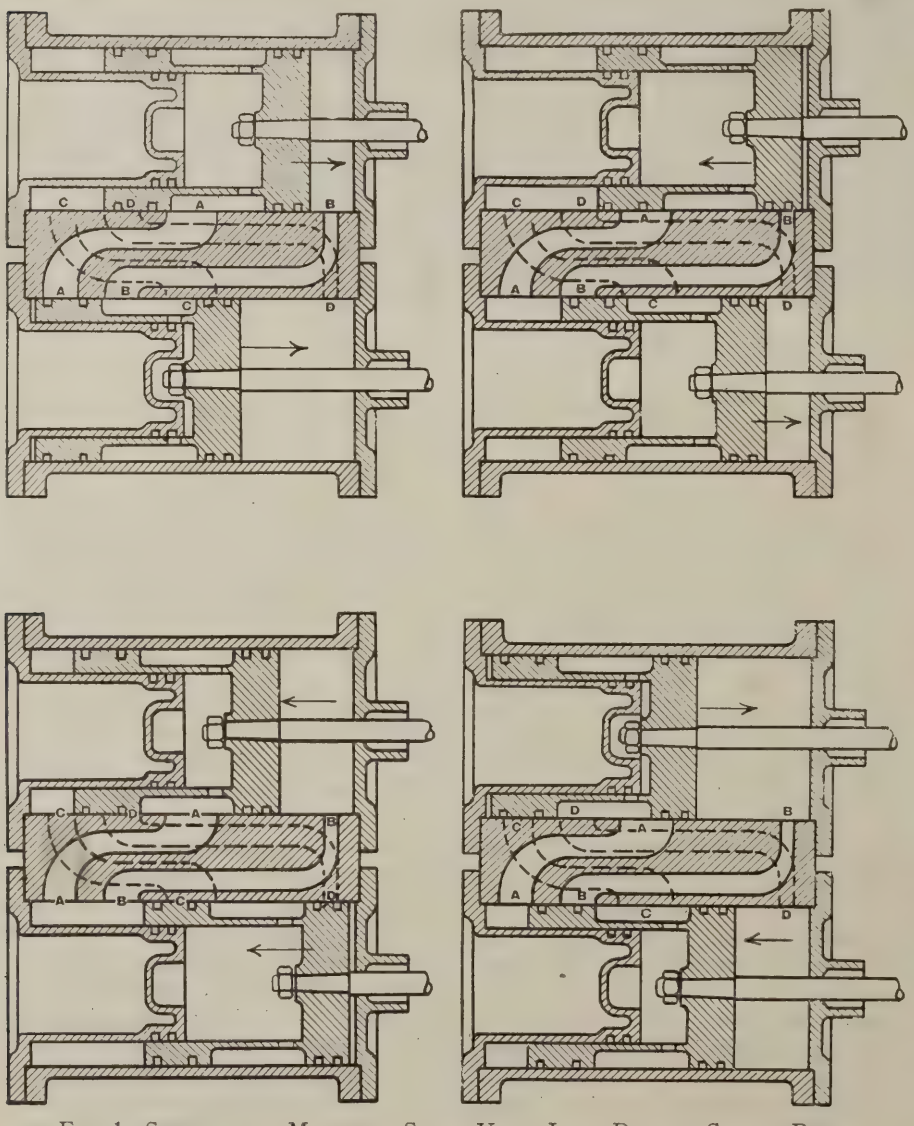


FIG. 1—SECTIONS OF MANISTEE STEAM-VALVE-LESS DUPLEX STEAM PUMP.

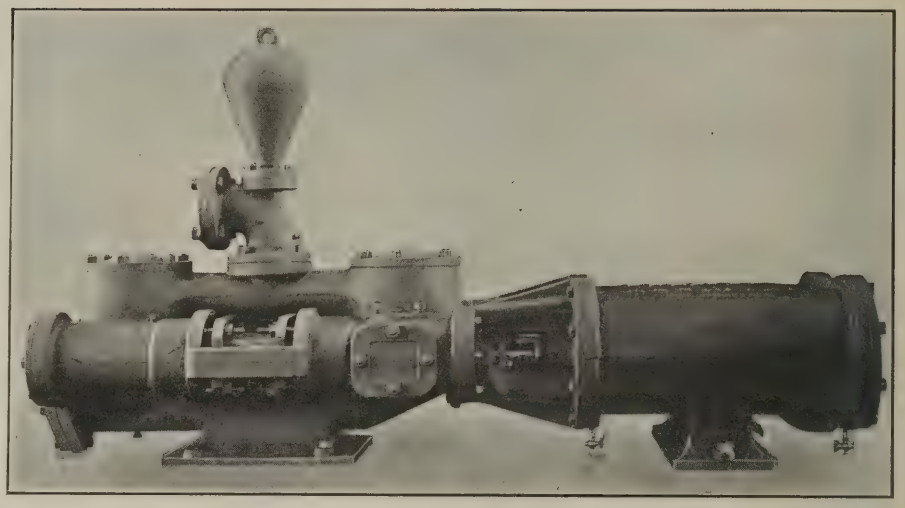


FIG. 2—MANISTEE STEAM-VALVE-LESS FEED PUMP.

This, together with the system of partial two-stage, or compound, working effectually prevents running away and this feature of full stroke and safe speed, regardless of losing suction, ought to be particularly valuable on water ballast work where the ordinary duplex invariably fails, as the "drying out" period approaches.

The elimination of outside working parts requiring lubrication or protection also makes possible distant or exposed installations, or the pump may be entirely enclosed. There is manifestly no opportunity for arrangement, since there is nothing which can be altered nor mis-adjusted and so far as the steam end is concerned, so long as the pistons are in working order, the pump must continue to operate.

Fig. 2 shows an outside center-packed pump of the 8 x 5 x 10-in. size, as made for marine use for boiler feeding and fire service.

OBITUARY.

Frederick Rehbaum, a well known marine engineer, died at his home in Buffalo on July 5. He had been with the Anchor Line for many years, and was chief engineer of the Wissahickon.

Gen. James A. Dumont, who was for 27 years connected with the Steamboat Inspection Service, died on June 14 at the home of his son in Rochester, N. Y. He was 86 years old and his illness was the first which ever confined him to bed. He held the position of supervising inspector general of the Steamboat Inspection Service for 25 years, retiring from that position to become inspector of hulls of steam vessels for the New York district. He retired from service in 1904.

Salving the Yucatan

THE Yucatan, a 336-ft. steel steamer of the Alaska Steamship Co.'s fleet, wrecked in Icy Strait, off the coast of Alaska, on Feb. 16, has been successfully raised after one of the most exceptional cases of salving known in the history of the Pacific coast. The Yucatan struck a floating iceberg in Icy Strait and was put ashore at Goose Bay, where she lay submerged to her boat deck for three months, and was completely gutted by icebergs floating over her. When the Alaska Steamship Co. turned over the wreck to the underwriters, the Puget Sound Salvage Co. began preparations to raise the vessel. The salvage steamer Santa Cruz left Seattle early in February and reached the wreck of the Yucatan on Feb. 19. The vessel lay with a three-degree list to port with water covering her to the bridge forward, and heavy pack ice over the after part. The Santa Cruz was unable to get alongside because of ice, but boat crews dodged in and out whenever the ice receded with the tide sufficiently to give them an opportunity to work. It was not until March 7, that the Santa Cruz, with her wrecking gear and big pumps could be brought alongside. Then the ice completely covered the after part of the vessel, the deckhouses having been carried away and everything swept clean to the house under the bridge on the forward promenade deck. The stern was stove in and the deck frames crushed out of shape by the ice, the surging of which soon gutted the after part of the vessel from the engine room casing aft until only the shell and the wreckage of the broken ends of the deck frames remained. For two weeks the salvors dodged in alongside the wreck when the tide carried away the floes for a little space, working for an hour or two and then hurrying back to Gull Cove, where the Santa Cruz went to shelter.

S. S. YUCATAN, LOOKING AFT, SHOWING DECK AND SIDES CRUSHED AND BROKEN.

Three divers went down from the steamer's boats, and had some narrow escapes. Often floating ice bore down against the boats carrying the air pumps, and signals were frequently sent to the divers urging haste because of ice threatening to interrupt the air supply. During March and the earlier part of April, the divers worked under the ice alongside while boats were kept busy in the effort to keep off floating ice.

The hole caused by striking ice and which necessitated beaching the steamer was but a small rupture about 1 x 3 ft. on the port bow, but the vessel was badly holed in beaching. There were bad ruptures under the engine room and in the after hold, and through one of the latter penetrated a ledge of rock. In order to get a patch over this wound, it was necessary to blast the rock away. Four cases of dynamite were used in this, the drilling being done by divers 35 ft. below the surface. This was arduous and slow work, but ultimately a steel patch was made fast. Hole after hole was repaired, and a big wooden pad, 9 x 14 ft., was made fast to the damaged hull, and then the pumps were started. Five 10-in. pumps were soon at work, throwing 3,000 tons of water an hour. When the steamer lifted, it was found that the patches were not satisfactory and she was allowed to sink again. On May 15, the pumps were again all started and the wreck lifted and taken to Mud Bay, and soon afterward to Hoonah, where temporary repairs were effected to allow of the voyage south which, with the assistance of the tug William Joliffe and the Santa Cruz, was made without incident, and the Yucatan was placed on the British Columbia Marine Railway Co.'s dry dock at Esquimalt.

BELOW DECK, SHOWING DAMAGE DONE BY ICEBERGS WHILE THE YUCATAN WAS LYING UNDER WATER IN ICY STRAIT.

The salvage of the Yucatan was accomplished by Capt. J. E. Pharo and his wrecking crew after nearly four months of difficult and disagreeable work, hindered constantly by icebergs, which also endangered the lives of the divers and salvage crew. The salvage company contracted to raise the Yucatan on a "no float, no pay" basis, $35,000 to be paid on delivery of the wreck.

S. S. YUCATAN BEFORE SHE WAS WRECKED.

On docking, it was found that 30 plates in the bottom and aft were damaged and must be replaced. About 30 ft. of the forefoot was carried away and the upper deck aft was badly damaged, as already noted. The boilers and machinery were intact. Tenders for the repair of the Yucatan were submitted by all of the large shipbuilding firms on the Pacific coast as follows:

Firm.	Place.	Amount.	Days.
Union Iron Works	San Francisco	$170,000	175
United Engineering Works	San Francisco	153,000	150
Moore Iron Works	San Francisco	122,500	150
B. C. Marine Ry. Co.	Victoria	125,000	130
Moran Ship Building Co.	Seattle	120,000	150
Wallace & Jenkins	Seattle	133,250	125
Hefferman Ship Building Co.	Seattle	119,460	7 mos.
Willamette Steel & Iron Works	Portland	89,000	140

The bids for the repair of the Yucatan are interesting as the lowest, that of the Willamette Steel & Iron Works is over $20,000 lower than the next higher bidder and less than one-half that of the highest bidder. The effect of the eight-hour day is apparent in the bids of the San Francisco firms, as labor makes the cost of ship repairing there the highest of any port on the Pacific coast.

The bid of the Willamette Iron & Steel Works will probably be accepted and after temporary repairs have been made at Esquimalt, the Yucatan will be taken to Portland for permanent repairs.

The insurance on the Yucatan was about $250,000, of which $75,000 is on disbursements. With a salvage item of $35,000 and $89,000 for repairs and incidental charges with new equipment at some $60,000 and a credit item of some $16,000 on old insurance, the underwriters save some $16,000.

The salving of the Yucatan is regarded by shipping men as one of the most difficult pieces of work that has been accomplished in this line on the Pacific coast in a long time. The Yucatan is a steamer of 3,535 tons gross, 2,317 tons registered tonnage, similar to the Northwestern, which was salved by the British Columbia Salvage Co. from Latouche Island. She is 336.5 ft. long and 43.2 ft. beam and 22.3 ft. deep, and was converted into a private yacht in the spring of 1909 and used for a pleasure excursion through Alaska during the summer by George W. Perkins and party from New York. In the fall of 1909, she was reconverted into a passenger steamship.

THE NEW CHIEF OF ENGINEERS, U. S. ARMY.

As interest is increasing in the improvement of rivers and harbors, so interest is being awakened in the man who directs the work. Only a few years ago, little attention was paid to the office of Chief of Engineers, although millions of dollars were expended annually under the direction of its chief. It is doubtful if half the inland navigators knew the name of the man who took final action on the pleas for the improvements which benefited them. On June 11, Gen. W. L. Marshall surrendered the reins of Chief of Engineers to Gen. William H. Bixby, a man particularly well fitted for the office—few officers are so well equipped.

Gen. Bixby has had a wide experience as an engineer officer. He has been connected with some of the most important river and harbor improvements in this country and has seen similar improvements in Europe. He has had charge of work on the Atlantic coast, having been stationed at Wilmington, N. C., and at Newport, R. I. He is, no doubt, better informed on the improvements of the Ohio river from source to mouth than any other engineer officer in the service today. Gen. Bixby was connected with the Ohio river from Oct. 6, 1897, to Jan. 15, 1902, and has since been a member of boards to consider proposed improvements for that river. For several years he had charge of the improvements of the Ohio for its entire length and also of many of its tributaries. He made frequent trips over the river and has been over its principal tributaries, so that he knows the conditions first hand. He is also well acquainted with the conditions on the Great Lakes, having been stationed at Detroit and Chicago. Gen. Bixby will, no doubt, be welcomed as Chief of Engineers by most of the lake navigators, because he is familiar with their needs. His last work in the field was on the Mississippi, he having been president of the Mississippi River Commission.

Gen. Bixby was selected as the engineer expert and accompanied the special congressional commission on an inspection tour of the principal waterways of Europe. Some years ago, he was representative of the United States Army to the French Army maneuvers.

As will be seen from the above, Gen. Bixby is particularly well fitted by experience for the office of Chief of Engineers. But more than that, he is a man of liberal ideas; he is progressive; he is quick to discern and appreciates good work. He wants details.

The British admiralty have placed a contract with Messrs. Yarrow & Co., of Glasgow, for two torpedo boat destroyers of a special type, involving many new features. In these vessels the constructors have been allowed to have a perfectly free hand in the design of the machinery, and consequently the trials of these destroyers will be awaited with considerable interest.

THE BRAZILIAN BATTLESHIP SAO PAULO.

Trials of the Brazilian Battleship Sao Paulo

THE trials of the new battleship Sao Paulo, built by Messrs. Vickers, Son & Maxim, Ltd., Barrow-in-Furness, for the Brazilian Navy, have just been carried out with the most satisfactory results. She is a sister ship to the Minas Geraes, recently completed by Messrs. Armstrong, Whitworth & Co. The ships are alike in design, and the two firms have succeeded in meeting the strategical and tactical needs with a large measure of success, as was clearly established during the trials. Notwithstanding that the draught of these vessels is limited, owing to the depth of water in South American waters, to 25 ft., a high fighting efficiency has been achieved.

The ships have twelve 12-in. guns so disposed that eight can be fired ahead, eight astern, or ten on either beam. In addition, there are twenty-two 4.7-in. guns and eight 3-pounders.

Secondly, the broadside is protected right fore and aft; the thickness is 9 in. in the center part for the full depth of 22 ft. 4 in., including 5 ft. below the load water line. This thickness is reduced to 6 in. forward and aft, and ultimately to 4 in. at the bow and stern; 9-in. athwartship bulkheads are located forward and aft at the ends of the 9-in. armor and protection against raking fire, while at the bow there is a 3-in. bulkhead, and at the stern a 4-in. bulkhead.

TABLE I.—MEAN RESULTS OF ALL TRIALS.

	48 Hours' Coal Consumption Trial.		30 Hours' Trial.		8 Hours' Trial.		Six Full-Speed Mile Runs, 250 lb. Boiler Pressure.	Two-Mile Runs, 280 lb. Boiler Pressure.
	Whole Trial.	Mile Runs.	Whole Trial.	Mile Runs.	Whole Trial.	Mile Runs.		
Date	May 21, 22, 23, 1910		May 24, 25, 1910		May 28, 1910		May 30, 1910	
Draught, forward	25 ft. 2 in.		25 ft.		24 ft. 5½ in.		24 ft. 8 in.	
Draught, aft	25 ft. 5¾ in.		25 ft. 3½ in.		25 ft. 1⅛ in.		24 ft. 10 in.	
Draught, mean	25 ft. 3⅞ in.		25 ft. 1¾ in.		24 ft. 9¼ in.		24 ft. 9 in.	
Displacement	19,645		19,460		19,133		19,110	
Mean i. h. p.	2,403	2,383	16,067	17,377	21,484	22,355	25,517	28,645
Mean revolutions	67.15	67.52	127	129.8	138.7	140.85	145.59	150.85
Mean speed knots	.....	10.61	.....	19.853	.....	20.99	21.231	21.623
Boilers in use	5	5	18	18	18	18	18	18
Coal consumption, lb. per i. h. p.	1.8	.....	.....	.....	1.42	.....	.....	.....

TABLE II.—MEAN RESULTS OF EIGHT HOURS' FULL-POWER TRIAL, MAY 28, 1910.

		Starboard.		Port.
Mean steam in boilers			248 lb.	
Mean steam at engines		229 lb.		223 lb.
Mean air pressure in stokeholds			0.49 in.	
Mean cut-off in M. P. cylinder		.....		.....
Mean vacuum (in.)		26.7		27.2
Mean revolutions		138.6		138.8
Mean pressure in cylinders (lb.)	High	89.24		95.18
	Intermediate	35.07		35.87
	Low, forward	17.36		16.33
	Low, aft	17.19		17.79
Indicated horsepower	High	3,133		3,319
	Intermediate	3,212		3,294
	Low, forward	2,153		2,024
	Low, aft	2,118		2,201
Total indicated horsepower		10,616		10,868
Gross total indicated horsepower			21,484	
Coal per indicated horsepower per hour			1.42 lb.	
Water loss per 1,000 i. h. p. per 24 hours = 2.2 tons.				

The heavy guns are mounted in barbettes with 12-in. and 8-in. armor, and the mechanism is covered with hoods. The several 4.7-in. guns, arranged on each broadside, are protected by the 9-in. armor, while the remaining guns on the upper works have shields.

In the third place the full speed attained—21.623 knots—practically equals the average rate attained by the British Dreadnought battleships, although special care had to be exercised in the design of the machinery in order that the steaming conditions might be easily met when using such coal as is readily available in South America, since this may not always be of the high calorific value of the better anthracites, and in order also to meet any deficiency in the skill of the stokers. Thus, for instance, the proportion of heating surface to grate area is about 36 to 1, as compared with from 30 or 33 in the British service. As a consequence, the boilers of the Brazilian ships are larger and heavier for a given power, but there is gain in greater reliability under the conditions of South American service. Reciprocating engines have been adopted and have proved of high efficiency, the radius of action, according to the results of the Sao Paulo trials, being 29 per cent greater than that guaranteed—or 12,913 nautical miles instead of 10,000 at 10 knots. The full speed on trial—21.623 knots—was realized with 28,645 i. h. p., while the guarantee was for 21 knots. On a trial of about four hours' duration, during which six runs were made over the measured mile, a speed of 21¼ knots was attained with 25,517 i. h. p. On an eight hours' trial a speed of 20.99 knots was got with 22,355 i. h. p., the guarantee being 20 knots.

There is thus the important advantage of a reliable high speed as well as a wide radius of action, added to offensive and defensive qualities of a high order, with a draught of only 25 ft., whereas in many of the later foreign Dreadnought ships the design is for draughts ranging up to 29 ft. and 30 ft. It is obvious that, especially in South American waters, the Brazilian ships must have a great tactical advantage in action. It should be remembered, too, that it is easier to find docking facilities where draught is thus limited.

The principal dimensions of the two vessels are as under:

Length over all	543 ft.
Length between perpendiculars	500 ft.
Breadth, molded	83 ft.
Depth, molded	42 ft. 3 in.
Draught	25 ft.
Displacement at 25-ft. draught	19,280 tons.
Speed at full power	21.623 knots.
Indicated horsepower	28,645 i. h. p.
Normal coal capacity on 25-ft. draught	800 tons.
Total bunker capacity	2,360 tons.
Radius of action determined on 48-hours' trial at 10.6 knots	12,913 sea miles.
ARMAMENT.	
Twelve 12-in., 45-calibre guns.	
Twenty-two 4.7-in., 50-calibre guns.	
Eight 3-lb. guns.	
ARMOR.	
Broadside	9-in., 6-in. and 4-in. cemented steel.
Protective deck	2 in.
Main bulkheads	9 in.
Gun-barbettes	12 in.
Forward and after athwartship bulkheads	3 in. and 4 in.
Machinery—Engines, triple-expansion, four-cylinder type.	
Diameters of cylinders:—High-pressure, 39 in.; intermediate, 63 in.; and two low-pressure, 73 in. Stroke, 3 ft. 6 in.	
Total cooling surface of condensers	24,000 sq. ft.
Boilers, eighteen of Babcock and Wilcox type.	
Heating surface	58,370 sq. ft.
Grate area	1,686 sq. ft.

The trials of the Sao Paulo were commenced on May 21, with a 48-hour run, at about 10 knots speed, to ascertain the power and the coal consumption for that speed, so that the radius of action, with the normal supply of coal on board for such cruising speed could be arrived at precisely. The mean results for these trials are given in Table I.

A week later, the vessel proceeded on a trial of eight hours' duration. The conditions in this case were that the piston speed should not exceed 1,000 ft. per minute, the steam pressure 250 lbs., the air pressure in the stokehold ½ in., and the coal consumption 2 lbs. per i. h. p. per hour. The mean results are shown in Table II.

It will be seen that with a piston speed of 970.9 ft. per minute, a steam pressure of 248 lbs. and on air pressure of 0.49 in. the average power developed was 21,484 i. h. p., while the coal consumption was only 1.42 lbs. and the

TABLE III.—RESULTS OF MEASURED-MILE TRIALS.

No. of Run.	Revolutions per minute. Starboard.	Port.	Speed, Knots.	Indicated horsepower. Starboard.	Port.	Total i. h. p.
SIX RUNS AT FULL POWER, FOR 1,000 FT. PISTON SPEED, ½-IN. AIR PRESSURE, 250 LB. STEAM PRESSURE.						
1	140.9	139.5	20.571	11,234	10,840	22,074
2	141.2	139.1	21.352	11,360	10,876	22,236
3	141.4	140.9	20.477	11,353	11,114	22,467
4	141.5	142.2	21.505	11,223	11,628	22,851
5	140.5	141.3	20.618	10,974	11,440	22,414
6	140.5	141.2	21.453	10,762	11,330	22,092
Means	141.0	140.7	Mean of means 20.99	11,151	11,204	22,355
	—— 140.85 ——					
SIX RUNS AT FULL SPEED WITH 250 LB. STEAM PRESSURE.						
1	145.8	145.5	21.617	12,631	12,828	25,459
2	143.3	142.6	20.979	12,039	13,404	25,443
3	144.8	144.5	21.302	12,393	12,542	24,935
4	148.0	145.9	21.052	13,027	12,712	25,739
5	146.3	147.1	21.686	12,913	12,992	25,905
6	147.5	145.8	20.93	13,038	12,586	25,624
Means	145.95	145.23	Mean of means speed 21.231	12,673	12,844	25,517
	—— 145.59 ——					
TWO RUNS AT FULL PRESSURE (280 LB.).						
1	152.8	151.4	21.428	15,301	14,648	29,949
2	149.8	149.4	21.818	13,593	13,749	27,342
Means	151.3	150.4	Mean of means 21.623	14,447	14,198	28,645
	—— 150.85 ——					

water loss 2.2 tons per 1,000 i. h. p. per 24 hours.

On the measured mile trials six runs were made in alternate direction so that the influence of tide was balanced, while the boiler pressure was not to exceed 250 lbs. There was no limit for revolutions or air pressure. In table III, the results are also given for these six runs.

The gunnery trials proved equally satisfactory, a complete broadside of eleven 4.7-in. guns being fired simultaneously with a broadside of ten 12-in. guns, so that a record in the way of broadsides was established. Admiral Bacellar fired this tremendous broadside, and everyone of the 21 guns responded.

THE YEAR'S SHIPBUILDING.

During the year ended June 30, 1910, there were built in the United States and officially numbered by the Bureau of Navigation 1,502 merchant vessels of 347,025 gross tons, compared with 1,362 of 232,816 gross tons during the fiscal year of 1909, showing a substantial increase of 114,209 tons.

On the Great Lakes 47 steel steamers of 146,896 tons were built, compared with 36 steamers of 88,426 tons during last year.

Fifteen new steel ocean steamers were launched, the largest of which was the Wilhelmina, of 6,974 tons. The schooner Wyoming, 3,730 tons, built at Bath, Me., is the largest wooden vessel ever built in the United States. The first square-rigged vessel launched since 1904 is the brigantine Viola, at Essex, Mass. Of the year's output 67,268 tons were barges and canal boats.

Following is the table:

	Wood.				Steel.				Total.	
	Sail.		Steam.		Sail.		Steam.			
	No.	Gross.	No.	Gross.	No.	Gross.	No.	Gross.	No.	Gross.
Atlantic and Gulf...	111	15,355	389	11,877	7	3,954	44	82,333	551	113,519
Porto Rico	6	38	2	18	..	.....	1	92	9	148
Pacific	9	1,758	238	6.887	1	32	7	3 165	255	11.842
Great Lakes	..	.....	152	3,177	..	.....	47	146,896	199	150,073
Western rivers	1	8	150	4,044	..	.....	4	123	155	4,175
Total	127	17,159	931	26,003	8	3,986	103	232,609	1,169	279 757

During the corresponding year ended June 30, 1909, 1 072 sail and steam vesse's of 171,864 gross tons were built in the United States and officially numbered, as follows:

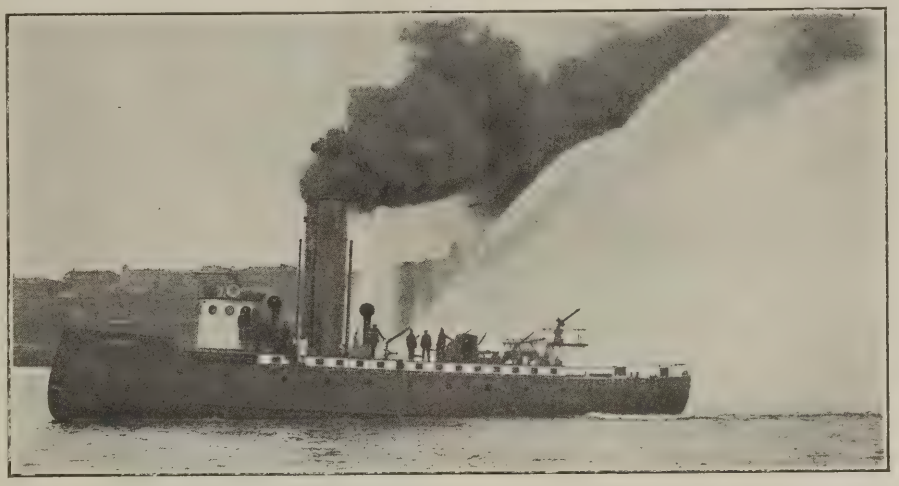
	Wood.				Ste l.				Total.	
	Sail.		Steam.		Sail.		Steam.			
	No.	Gross.	No.	Gross.	No.	Gross.	No.	Gross.	No.	Gross.
Atlantic and Gulf...	108	18,835	395	9,781	8	7.472	23	28 613	534	64,701
Porto Rico	7	79	...	.....	..	.....	..	.....	7	79
Pacific	17	287	204	11,533	..	.....	1	499	222	12,319
Great Lakes	...	.....	99	1,644	1	513	36	88 426	136	90.583
Western rivers	...	.....	167	3,762	..	.....	6	420	173	4,182
Total	132	19,201	865	26,720	9	7.985	66	117,958	1.072	171 864

COMPARATIVE STATEMENT. ....

1910.	No.	Tons.	1909.	No.	Tons.
Sail and steam	1,169	279 757	Sail and steam	1,072	171 864
Unrigged	333	67,268	Unrigged	290	60,952
Total	1,502	347,025	Total	1 362	232.816

DUWAMISH MAKES GOOD.

The new Seattle fireboat, Duwamish was launched and put into service in February, 1910. On May 18, she was sent out for a private trial by the fire department crew. The photograph shows one 2/4-in., three 2-in. and three 11/2-in. nozzles working, using in all 9,300 gallons of water per minute. On May 20 the Duwamish had her first fire call to the plant of the Independent Asphalt Co., but June 10 brought the first real fire fighting. The Duwamish worked her monitors for 40 minutes and pumped all night through hose connections in quelling the conflagration in the north and waterfront of Seattle. The Duwamish handles well, develops a speed of 15 miles an hour and is proving satisfactory in every respect in protecting Seattle's 20 miles of waterfront.



NEW SEATTLE FIREBOAT DUWAMISH IN ACTION, MAY 18, ON HER TRIAL TRIP.

CUNARD STEAMSHIP CO.'S REPORT.

The following financial report of the board of directors of the Cunard Steamship Co. for 1909 is commended as a model of lucidity and brevity. It omits no detail of importance:

The accounts, which have been duly certified by the auditors, show that the profits for the year, including £3,582 6s 8d brought forward from 1908, amount to £664,002 12s 9d. After debiting income tax and interest, reserving £376,483 18s 0d for depreciation of ships and wharf properties, and transferring £66,598 9s 8d to the insurance fund in settlement of claims and expenses for the year, there remains at the credit of profit and loss account, £86,988 3s 9d. The directors regret that they are unable to recommend the payment of a dividend as they consider that their first duty is to strengthen the company's reserves; they have, therefore, transferred £80,000 to the reserve fund, leaving a balance of £6,988 3s 9d, which is carried forward to the credit of profit and loss account, 1910.

The balance at the credit of insurance fund stands at £400,000, and the reserve fund has been increased to £230,000.

There has been paid during the year £130,000 to the sinking fund for the redemption of the stock established under the government agreement.

The balance of the £1,600,000 4½ per cent mortgage debenture stock created during 1908, amounting to £800,000, has been issued.

The company's passenger business during 1909 showed a decided improvement over that of the previous year. Emigration to the United States increased considerably, but this was offset to some extent by the fact that the eastbound third class traffic was sensibly less than in 1908—that year having been abnormal. It is satisfactory to report that

the lines engaged in the New York-Mediterranean business were able during the year to compose their differences, and third class passenger rates in this trade have, therefore, been restored to a normal level.

American freights westbound were maintained, but eastbound remained disappointing.

The Lusitania and Mauretania continued to give evidence of great popularity with the travelling public.

With the view of enabling the large numbers of eastbound passengers now travelling by the company's steamers to reach London and the continent in the shortest possible time, arrangements were made in August to call at Fishguard. Subsequently it was found necessary to omit the call at Queenstown eastbound with the mail steamers leaving New York on Wednesdays, in order to ensure the earliest possible arrival at Fishguard.

The company's steamer Slavonia unfortunately stranded on the Island of Flores, one of the Azores, in June last, whilst on a voyage from New York to the Mediterranean, and subsequently became a total loss. The vessel was insured for part of her value, and the balance of the loss has been written off.

In consequence of a fire breaking out on the Lucania whilst in dock at Liverpool in August, the steamer was so considerably damaged that it was necessary to abandon her to the underwriters as a constructive total loss. The Lucania was insured for the full value at which she stood in the company's books.

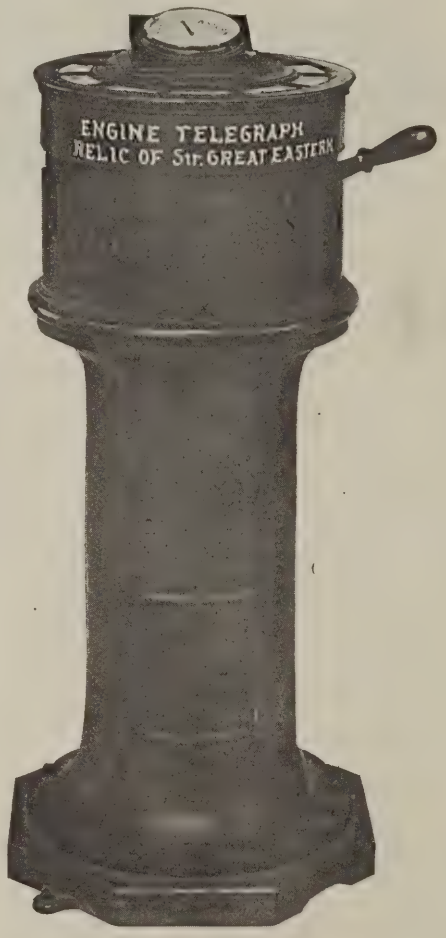
The steamers Etruria, Aleppo, Cherbourg and Saragossa, being no longer suitable for the trades in which they were employed, have been sold. To maintain the Liverpool-Mediterranean cargo service, the company have purchased three suitable steamers, which have been re-named Phrygia, Thracia and Lycia.

A contract has been placed with Messrs. Swan, Hunter & Wigham Richardson, Ltd., for the building of a new steamer (the Franconia) of 18,000 tons gross, which is intended to be employed in the Boston trade and the trade between the United States and Mediterranean ports. It is anticipated that she will be delivered in the beginning of the year 1911.

MARINE EXHIBITS AT DETROIT INDUSTRIAL EXPOSITION.

Among the exhibits at the Detroit Industrial Exposition, June 20 to July 6, were several of interest to ship builders and owners. The American Blower Co. had a very complete exhibit, including blowers, direct connected to a generator. The ventilating system included an air-washing equipment, such as is now frequently installed in large buildings and passenger ships.

The Chicago Pneumatic Tool Co. exhibited a line of pneumatic drills, chipping and riveting hammers, cleaners, etc. The Detroit Copper & Brass Rolling Mills displayed a large variety of brass and copper sheets, wire and rods, the latter in various sections and sizes. Seamless steel tubes, now so extensively used in boiler work and for other purposes aboard ship, were exhibited by the Detroit Seamless Steel Tubes Co. The



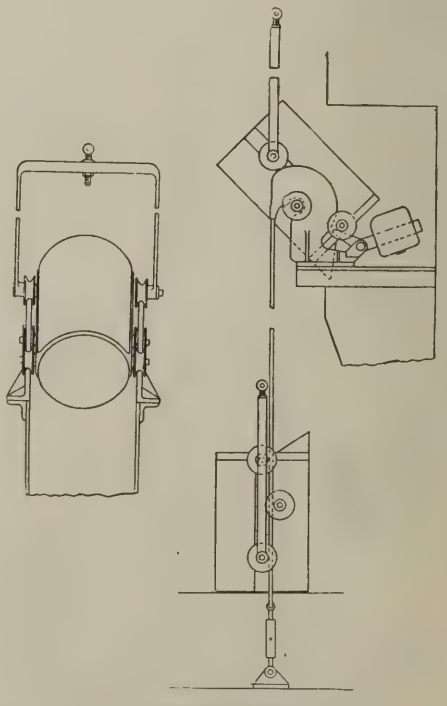
PROBABLY THE FIRST ENGINE TELEGRAPH EVER INSTALLED ON A STEAMER.

Detroit Ship Building Co. had an attractive exhibit, including a steam steerer, metallic life boats and rafts and a wide range of ship fittings and marine hardware. An interesting feature of this exhibit was the engine room telegraph used on the famous Great Eastern in 1865, when that ship was engaged in cable laying. This telegraph was probably one of the first examples of mechanical communication between bridge and engine room and bears the name of The Atmospheric Telegraph Co., London, as maker. The Great Lakes Engineering Works had on exhibition a model of the car ferry Ashtabula, built by that company for Lake Erie trade in 1905, and also a model of the steamer Wm. P. Palmer, one of three which the company has on contract for the Pittsburg Steamship Co., the lake end of the United States Steel Corporation. Boh models are built on a scale of ¼ in. per foot, and are handsome pieces of work. The Palmer, as has been already announced, is being built on what is known as the Isherwood system of longitudinal framing and is the first to be built on that system for great lakes trade. The company also exhibits a 50-ton ice machine, together with a model of the new cell block system for making ice from raw water without distillation. The Vinton Co., which, as is well known, has done the interior work for a number of the best lake passenger steamers, also had an exhibit of woodwork and interior trim.

PROCTOR'S PATENT SELF-TIPPING BUCKET.

Another development in the patent silent ash hoist, associated with the name of W. E. Proctor, of the firm of Messrs. F. J. Trewent & Proctor, naval architects and consulting engineers, of Billiter street, London, is a patent self-tipping bucket, as here illustrated.

This type of bucket is the outcome of a series of experiments to obtain the best and least complicated arrangement, and is not only practically noiseless, but



Proctor's Patent Self-tipping Bucket

very simple, the working parts consisting only of guide rollers or pulleys, which cannot get out of order. One man can fill the bucket and work the hoist from the stokehold floor level. The illustration is almost self-explanatory. There are three cast steel brass-brushed guide wheels on each side of the bucket, and two wire rope guides, which pass between the wheels, as shown, the top end of each guide being attached to a thin cast steel plate or header. When the bucket is lifted, the middle wheel runs into the slot shown, while the top wheels run round the periphery of the header, and cause the bucket to tilt. The levers and weights are provided in case the vessel has a heavy list, in which case, the levers give the bucket a push back again to the vertical position. It also has the advantage of bringing the bucket quietly to rest. The only fitting necessary, beyond fastening the wire ropes at the bottom end and as attachment for the pulleys, is a couple of angle bars on each side of the shoot on which the headers can be fastened, as shown in the diagram. This arrangement of self-tipping bucket can be supplied separately for working in conjunction with other types of hoist if desired.

Duluth, Missabe and Northern Railway's Coal Dock

THE United States Steel Corporation is steadily developing its physical equipment for the economical handling of its raw material and products of manufacture. Being blessed with abundant resources it does not falter at the expenditures of large sums to achieve any desired end. The new coal dock of the Duluth, Missabe & Northern Railway, Duluth, is a case in point.

This dock was built to care for the fuel requirements of the Duluth, Missabe & Northern Railway and of the numerous iron ore mines contributory to the railways. The dock is 2,000 ft. long and 604 ft. wide, situated on St. Louis Bay contiguous to the ore docks. It is one of the most complete structures of its kind in existence. Its fire fighting equipment is especially complete. Much thought has been given to this feature as the dock is somewhat isolated. A fireproof pump house is placed about midway on the outer end of the dock containing an 8-in. Aldrich triplet pump geared to a 75-H. P. motor. The pump draws water from the bay and discharges from a 6-in. main extending the full length of the dock, hydrants being placed at intervals and hose reels being kept in convenient places ready for immediate service. In addition the fire boat McGonagle, stationed at the ore docks adjacent, is available.

The dock is built upon a reclaimed area and extends from the shore line to within 150 ft. of the 300-ft. channel maintained by the Federal government. This channel provides 26 ft. of water and the intervening space between it and the outer end of the dock has been dredged to a similar depth, thus securing a waterway 450 ft. wide. The equipment is so arranged that coal is unloaded from vessels moored at the end of the dock. The coal handling machinery, designed and erected by the Mead-Morrison Mfg. Co., of Cambridge, Mass., consists of the following units: Three one-man steel counterbalanced hoisting towers traveling along the end of the dock; a cable railway system which delivers coal from these towers to storage or to elevated pockets; a double pick-up steel bridge that reclaims coal from storage to the cable railway system and pockets; a railroad car haulage system and belt conveyors for handling screenings from the pockets. All of this equipment is electrically operated by General Electric motors.

The three counterbalanced steel towers travel along the end of the dock on a steel trestle 450 ft. long and 35 ft. high above the level of the dock. They are equipped with a two-ton capacity Rawson grab bucket operated on a 53-ft. boom swung out over the water from the tower. The boom is pivoted on a universal joint at the point of its support at the inner end, permitting it to be swung through a horizontal angle of 180 degrees. This arrangement enables the boom to clear the mast of vessels at the end of the dock. The towers hoist the coal about 80 ft. from the vessel and as they are self-propelling they can accommodate their position readily to the different hatches of the vessel. The bucket delivers to a hopper in the tower and from this hopper four-ton cars of the cable railway system are supplied automatically.

The cable railway system has a loop on the trestle at the end of the dock. The ends of this loop are connected on the shore side of the trestle with two tracks on a second trestle extending the full length of the dock along its center line. At the shore end of this long trestle the tracks also are connected by a loop, thus forming a continuous circuit over which the four-ton cars are operated. The pick-up bridge covers the storage space of one side of the trestle on the center line of the dock. The track on the adjacent side of that trestle is arranged so that cars may be diverted from it and sent around a loop which extends to the outer end of the bridge and back to the trestle again.

The hopper in each of the hoisting towers to which the respective grab bucket delivers coal is equipped with a car loader, by means of which the cars are filled without stopping, obviating the necessity of an attendant at that point.

THE DULUTH, MISSABE & NORTHERN RAILWAY'S COAL DOCK AT DULUTH.

The hopper has a motor-driven gate through which coal is fed to a pan and the latter is tripped automatically to discharge its contents into each passing car. When the pan is full, the gate motor is also stopped automatically, provision being made to prevent the pan from spilling coal when no car is under it. The four-ton cars are hauled on the trestle by a continuous cable, each of them being equipped with a swivel cable grip which is arranged with a grip that releases the cable automatically at points desired. The cars have side doors which are unlatched automatically by a tripper placed at any point along the track where the coal is to be discharged. The cable travels at the uniform rate of 300 ft. per minute.

The first 800 ft. of the trestle on the center line of the dock is a steel structure carrying two tracks of the cable railway system at a height of 35 ft. above the surface of the storage space. For the remaining 1,200 ft. of its length this trestle has timber bents supporting continuous storage pockets under the tracks of the cable railway. The pick-up bridge travels along one side of the trestle with one end overhanging the latter and spans the storage space on that side of the dock. The bridge consists of a pair of trusses spaced 21 ft. apart and carried at each end on a two-leg tower. The towers are mounted at the base on wheels traveling on rails laid the length of the storage space, these rails being 262.5 ft. apart on centers. The lower chords of the trusses are placed so coal can be piled to a height of 32 ft. across the storage space and the bridge has a travel of 1,700 ft. The single track loop of the cable railway that is carried by the bridge is laid on floor beams between the lower chords of the trusses. When the cars approaching from the outer end of the dock are to be shunted over the bridge, the tripper is set to release the cable grip just before the bridge is reached. The cars thus retain sufficient momentum to mount the turn-out and continue a short distance along the bridge. A chain haulage driven by a 500 H. P. motor in a cabin on the end of the bridge is provided to move the cars on the bridge. This chain engages the grip on the truck of the car and pulls the latter around the loop until a connection to the trestle track is reached. At this point the haulage chain releases automatically and the grip is attached to the cable by a man on the trestle. Cars can be supplied automatically at any point in their travel along the bridge by means of a tripper which unlatches their doors. The bridge is equipped with two-ton drag line scoop buckets, one of which is placed on each side of it. Each of these buckets is suspended from a trolley carriage operating on a runway carried on arms cantilevered beyond the top chord of the adjacent truss. The bucket is hauled back and forth along the runway and raised and lowered by a double drum hoist in a cabin on the tower. Each of these hoists is geared to an individual 150-H. P. motor and either of the motors can be used to drive a traction gear that traverses the bridge along the dock. A hopper is placed at the end of each bucket runway directly over the track of the cable railway system on the bridge side of the trestle. The buckets discharge the coal into the respective hoppers and it is fed from the hopper to the cars for delivery to the row of elevated pockets. The arrangement of the tower equipment is, therefore, such that coal can be unloaded from the vessels, delivered to storage and reclaimed later or it can be handled directly to the row of pockets for immediate shipment. Obviously the greater percentage of coal goes into storage to meet the demand for coal during the winter.

The cars thus follow in continuous operation from the hoisting towers around the loop to the long trestle, thence are diverted over the pick-up bridge to discharge their loads and return to the trestle to continue to the end of the latter, from which they come back on the second track to the hoisting towers. When coal is being reclaimed, the cars do not pass over the bridge, but are halted long enough on one of the hoppers on the end of the latter to receive a load. During the direct transfer of coal from vessels to the row of pockets the cars do not pass over the loop on the pick-up bridge. The row of pockets are placed high enough to discharge by gravity into railway cars on a track at the dock level that parallels closely the trestle. The bottoms of the pockets are built on a slope toward discharge openings at the side on which the railroad track is placed. The openings are spaced 12 ft. apart and between them the pockets are divided transversely by tight partition walls. Each of the 83 pockets has a capacity of 35 tons, making a combined capacity of 7,055 tons. The discharge openings are each controlled by a gate operated by hand from a walk at the ground level. These gates are set high enough to deliver the coal by gravity through spouts to cars on the standard gauge track laid along the row of pockets.

PICK-UP BRIDGE OF THE DULUTH, MISSABE & NORTHERN RAILWAY'S COAL DOCK.

At each discharge gate for a distance of 500 ft. from the shore end of the row provision is made to screen the coal by passing it over a grizzly. The screenings drop on a 24-in. conveyor belt which delivers them at the end to a bucket elevation. The latter discharges them in turn into a hopper with two chutes leading from it, one to the top of the end of the trestle and the other to a conveyor extending across the storage space served by the pick-up bridge. Cars on the cable railway system can be supplied from the first chute and the screenings thus delivered back to the pockets for shipment. The cross conveyor to which the second chute delivers is placed on a trestle and is arranged so that the screenings may be discharged from it at any point in the width of the storage space. The trestle carrying this belt is built to permit the pick-up bridge to clear it and reclaim the screenings from these piles to the cars of the cable railway for delivery to the storage pockets the same as other coal.

The car haulage system has been provided to shift cars on the two standard gauge tracks on the axis of the dock. The necessity of maintaining a switching engine on the latter is thus avoided, minimizing the fire risk. The cable of the haulage system extends the full length of one track from a hoist in a house at the outer end of the dock to a sheave at the shore end of the pockets and then back along the other track to the hoist again.

A recording scale installed on the dock enables a record to be obtained of each car of coal shipped.

Power is derived from the Great Northern Power Co., of Duluth. The dock was designed by H. L. Dresser, chief engineer of the Duluth, Missabe & Northern Railway, and the dock was built by the Barnett & Record Co., of Minneapolis, Minn.

The Progress of Warship Engineering

TO THE 1909 edition of "Fighting Ships" a careful analysis of warship engineering during the past year is once again contributed by C. de Grave Sells, M. Inst. C. E. Prominence in this survey is naturally given to turbine machinery, a good deal of attention being bestowed upon the comparative trials of the United States cruisers Birmingham, Chester, and Salem, dealt with already at some length in these columns. At the outset Mr. de Grave Sells remarks that during the past 12 months a greater readiness has been shown on the part of the authorities of the other navies of the world to follow the example of the British navy in the adoption of turbine engines for the propulsion of their ships, but the principal feature of the year has been the acceptance of other types of turbines for ship propulsion besides the two generally recognized as having proved themselves suitable for marine service. The Parsons type, however, is still well ahead of all others, but the adoption of the Curtis type for a British cruiser and the assumption of the license to manufacture by Messrs. John Brown & Co. of Clydebank, combined with the excellent results obtained with the Salem have given this type a very considerable increase in favor.

The Internal Combustion Engine and the Use of Gasoline.

In the course of a note on internal combustion engines the author remarks that most navies have now some few craft fitted with these engines, but the general adoption of such engines for naval purposes has been greatly retarded by the greater attention given by designers and constructors to gasoline and paraffine motors, rather than to the development of engines using mazout, which is generally considered to be the only fuel permissible for naval purposes.

This point has been emphasized on several occasions recently by small mishaps, but the disaster on the Italian submarine Foca, which resulted in considerable loss of life, should determine once for all the entire abolition of such substances from vessels of war and especially so for use as fuel. It is well to again insist on the point that in a war vessel the one thing to provide for is to render her as perfect and as serviceable as possible for use in war, otherwise there is but little reason for her existence. It is certainly possible to run boats with gasoline in comparative safety so long as their compartments are freely open to the outer air, but in a war vessel, with its sundry compartments and difficult ventilation, the oversight of a small leak may lead to an accumulation of inflammable and explosive vapor which may even in peace time, have dire and fatal effects.

The use of gasoline must be absolutely dispensed with, and, whilst paraffine is much safer and less objectionable for war ships, still even this has its dangers, and it is well to adopt mazout, which is the only absolutely safe fuel for such purposes.

Marine Suction Gas Plant in Operation.

The author includes an interesting description of the suction gas engines and Capetaine producer-plant in use on board the gun-boat Rattler. He mentions that since her transformation the Rattler has run about 2,000 miles at an average speed of 8 to 9 knots. The fuel used has been Scotch anthracite, costing 15s 6d per ton, and it is found that the consumption is about 50 per cent of that originally consumed of best Welsh coal to obtain the same result. The machinery is found very handy for getting under weigh. From taking charge the vessel can be started in 30 minutes, and, when the engines are finished with, 10 minutes is sufficient for the engine staff to leave everything in good order. In space and weight the new installation saves about 25 to 30 per cent as compared with steam machinery, and whereas as a steamship the engine-room and stokehold complement consisted of four engineers and 13 stokers, she now requires only three engineers and four producer attendants. But the work of these latter is very different indeed to what was required of the stokers, as the charging of the producer is much simpler work, and requires to be carried out once only in every two hours.

The undoubted advantages of the system over steam machinery for such an installation will probably lead to its being adopted for small vessels for harbor use and vessels having a regular service from a fixed base, but there seems no probability of its extensively displacing steam machinery under ordinary conditions.

The Status of Engineer Officers.

Mr. de Grave Sells devotes some space also to the question of the status of engineer officers, and gives a careful summary of the reforms which the engineer officers of the British navy, in their recent statement of disabilities, have set forth as being necessary.

Concluding this part of his review, Mr. de Grave Sells says that "the world in general has come to realize that thorough efficiency in any special branch can only be realized by special devotion to that branch, and this is truer in engineering matters than in any others. In this special line, too, the extent of the knowledge required covers a very large area, for the complex mass of machinery due to human ingenuity contained within the hull of a warship is no small matter, and each particular portion has its special needs, for which practical experience of those needs is required. So that to be a *real* engineer, the officer must give all his time and all his thoughts to his profession, and it is folly to suppose that he can attain to the required grade of perfection if the larger portion of his time is given to such entirely alien matters as those appertaining to many of the duties of the executive officer. To continue in this direction is to court disaster, for in time of peace. It must be realized assuredly be found wanting, however well they may have been bolstered up by their more experienced subordinates in time of peace. It must be realised that the result of the battle will absolutely depend as much on the machinery and the engineer staff as it does on the guns and the men behind them. The engineer officers of the past and present have always responded splendidly to what was required of them, and it should be the aim of all concerned to render the engineer officers of the future as near perfection as possible, and this can only be done by

a full recognition of the fact that they must be *real* engineers, and *engineers only*.

Among other subjects dealt with are turbine lifting gear; Prof. Weighton's air gage; the combination system of reciprocating engines and turbines, as developed on the steamship Otaki; torsion meters; a new arrangement of Belville boiler; a new type of firing indicator introduced in the French navy; patent fuel; liquid fuel; engine room telegraphs; gun elevating gear; and the cruise of the United States battleship fleet.

Accidents of a Month

ACCIDENTS during June were neither numerous nor costly. Had it not been for the stranding of the L. C. Smith near Two Harbors, on June 23, the financial loss would have been small. The Smith, however, is badly damaged and it will cost about $30,000 to repair her.

Probably the most surprising accident was the stranding of the steamer L. C. Hanna on the outer rocks off Kettle Point, being fully 25 miles out of her course. A thick pall of smoke overhung the lower end of Lake Huron and delayed many vessels. The Hanna was released after 4,000 tons of her cargo of iron ore had been lightered. Forest fires, which have been raging in the upper region, have hindered navigators not a little. Little attention has been paid to this feature in the newspapers, but the smoke really covers a more extended area than is generally appreciated. The fact that accidents were so few is both creditable and encouraging. Certainly masters have had it hammered into them by their owners that dispatch is a second consideration to safety: Following is the list:

DATE.	NAME OF VESSEL.	NATURE OF ACCIDENT.	PLACE.
June 10	Str. A. L. Hopkins	Collided with str. Syracuse; badly damaged on port side; number of seams opened; machinery was dislocated	Near Southeast Shoal, Lake Erie.
June 10	Str. Syracuse	Collided with str. A. L. Hopkins; not damaged	Near Southeast Shoal, Lake Erie.
June 10	Str. Raleigh	Collided with str. Selwyn Eddy and ran on bank; released on 11th; in dry dock at Cleveland one week, to make repairs	Near Russell Island, Lake St. Clair.
June 10	Str. F. B. Wells	Collided with str. John A. Donaldson	Lake St. Clair.
June 10	Str. Jno. A. Donaldson	Collided with str. F. B. Wells	Lake St. Clair.
June 18	Str. Frontenac	Hit by str. Eastland on starboard side; one plate cracked	Cleveland.
June 23	Str. L. C. Smith	Stranded in dense fog on rock; released on 26th; No. 1 compartment badly punctured; hole 20 ft. long in side, and bottom badly damaged; docked at Toledo; repairs estimated at $30,000	Near Two Harbors, Lake Superior.
June 29	Bge. Pennington	Struck pier, the jar throwing one man overboard and drowning him	Foot of Weitzel Lock, Soo River.
June 29	Str. E. J. Earling	Collided with str. Omaha; slightly damaged	St. Clair River.
June 29	Str. Omaha	Collided with str. Earling; slightly damaged	St. Clair River.
June 30	Str. W. B. Schiller	Ran aground, owing to heavy smoke from forest fires; released, uninjured	Round Island, St. Mary's River.
June 30	Str. W. B. Eads	Ran aground, owing to heavy smoke; released after lightering 200 tons; docked at Cleveland; six plates damaged	Round Island, St. Mary's River.
June 30	Str. Lagonda	Ran aground in heavy smoke; released, uninjured	St. Mary's River.
June 30	Str. Uganda	Hole punched in starboard bow	Cleveland Harbor entrance.
July 1	Str. D. Leuty	Ran ashore	Bacon Island.
July 1	Bge. B. W. Jenness	Collided with str. F. B. Squire; bad hole in port bow	Detroit River, near Grosse Isle.
July 1	Str. F. B. Squire	Collided with bge. Jenness	Detroit River, near Grosse Isle.
July 2	Str. La Belle	Stranded in thick weather; lightered 1,600 tons of ore and was released July 3, uninjured	Hay Lake.
July 4	Str. John A. Donaldson	Ran ashore, owing to disabled steering gear; wheel chains parted; driven on shore; released July 6 after lightering 2,500 tons	Little Rapids Cut, near Soo.
July 4	Str. Black Rock	Ran ashore; released July 5 after lightering	Near Hammond's Bay, Lake Huron.
July 5	Str. L. C. Hanna	Ran ashore; Nos. 2 and 3 compartments full of water; bottom forward badly torn; released on 6th after lightering 4,000 tons of ore; will be docked at Lorain or Cleveland	Kettle Point, Lake Huron.

LAKE TRADE DURING JUNE.

June on the lakes has been a most unusual month. It was early apparent that there was not sufficient work for all of the ships and the independent vessel owners voluntarily tied up one-fifth of their tonnage. During the month 38 vessels went into ordinary, notwithstanding which the ore movement was the heaviest on record. In fact, heavy as it was it did not keep the active fleet busy, there being continually more ships than cargoes. The lesson is obvious. There are more ships on the lakes than are needed. Two things have contributed to bring this condition about—the first, the rapid increase in the size of ships with the consequent increase in average cargo; the second, the rapid and astonishing development of the unloading machine, making possible the discharge of a 10,000-ton cargo in a working day of ten hours. This indeed has been a common occurrence and has made it possible for the favored ship to make an extra trip or two during the season.

The inevitable consequence of this evolution will be a cessation of ship building for independent interests. The lakes are not likely to see for some time to come the promotion of independent companies for the construction of bulk freighters such as has marked the business for the past few years. Whatever contracts are let will come from producing and consuming interests such as the steel-making companies. Even with 20 per cent of the ships laid up, the fleet is having no difficulty in moving the product and it cannot now be predicted when business will be forthcoming for the 20 per cent now in ordinary. The June movement of ore was very heavy, over 7,000,000 tons, which may be fairly said to approximate the maximum for the remaining summer months.

Another interesting feature of the month was the suit of the government to dissolve the Great Lakes Towing Co. as a trust. In the government's petition the Towing company was charged with stock ownership and other control of various towing and wrecking companies, alleging that some of them are represented as independent concerns. The effect, according to the government petition, has been discrimination in rates by which favored vessels are handled at low prices while owners of other vessels are required to pay excessive charges. Injunctions to wind up the business are asked for the following companies: Great Lakes Towing Co., Dunham Towing & Wrecking Co., Thompson Towing & Wrecking Association, Hand & Johnson Tug Line and Union Towing & Wrecking Co. The government demands restoration of the old towing and wrecking companies to their former positions as independent concerns.

An irritating feature was the brief strike of the licensed tugmen at Cleveland and Ashtabula for a shorter working day. This was in defiance of a two-year agreement which had been entered into last spring with the towing

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Records show over 300 wrecks and accidents on the Lakes in 1909, a large percentage of which were due to groundings in fogs and heavy weather.

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Boats using

UPSON'S
IMPROVED SOUNDING MACHINE
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are insured against delay, as soundings can easily be taken with vessel running at full speed.

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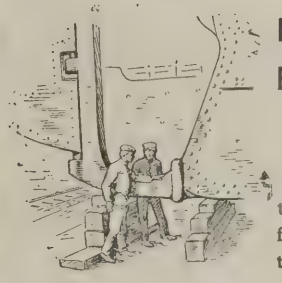

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Process sanctioned by the British Corporation for the Survey and Registry of Shipping.

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company. The tugs in both harbors were idle for a few days when the men were persuaded to return to work under the terms of their original contract.

COMMERCE OF LAKE SUPERIOR.

The commerce of Lake Superior as measured by the canals at Sault Ste. Marie during June was 9,839,872 tons. The Canadian canal is still carrying the greater portion of this commerce owing to more favorable draught. The commerce to July 1 totals 20,327,071 tons against 12,117,367 tons for the corresponding period during 1909, showing the substantial increase of 8,209,704 tons. Following is the summary:

	To July 1, 1909.	To July 1, 1910.
EAST BOUND.		
Copper, net tons	34,731	39,610
Grain, bushels	9,182,563	16,002,846
Building stone, net tons	880	500
Flour, barrels	1,691,948	2,085,397
Iron ore, net tons	8,073,482	14,111,808
Pig iron, net tons	7,290	5,691
Lumber, M. ft. b. m.	146,245	185,693
Wheat, bushels	19,002,817	23,596,451
Unclassified freight, net tons	48,149	36,301
Passengers, number	4,767	5,250
WEST BOUND.		
Coal, anthracite, net tons	448,397	642,670
Coal, bituminous, net tons	1,893,135	3,350,029
Flour, barrels	1,320	1,000
Grain, bushels	500	2,100
M'f'c't'd iron, net tons	120,835	162,560
Iron ore, net tons	3,474	.....
Salt, barrels	243,379	276,335
Unclassified freight, net tons	280,381	403,337
Passengers, number	4,820	6,732
SUMMARY OF TOTAL MOVEMENT.		
East bound, tons	9,334,789	15,727,533
West bound, tons	2,782,578	4,599,538
Total	12,117,367	20,327,071
Vessel passages	4,480	6,715
Registered tonnage, net.	9,938,707	16,978,402

LAKE SHIP BUILDING.

The bulk freighter W. J. Olcott, building at the Ecorse yard of the Great Lakes Engineering Works, for the Pittsburg Steamship Co., was launched on Saturday, July 9. This is the first of the three steamers building for this steamship company to be launched. The Olcott is 600 ft. over all, 580 ft. keel, 58-ft. beam and 32 ft. deep.

The tug E. P. Dempsey was launched from the Cleveland yard of the American Ship Building Co. for the Kelley Island Lime & Transport Co., June 2. The Dempsey is 87 ft. over all, 77 ft. keel, 20 ft. beam, and 10½ ft. deep.

The bulk freighter Theodore H. Wickwire Jr., building for Boland & Cornelius, of Buffalo, was launched from the St. Clair yard of the Great Lakes Engineering Works on July 25.

Four tugs were launched on June 11 at the Lorain yard of the American Ship Building Co. for the Booth Fisheries Co. The tugs are named Cincinnati, Louisville, Nashville, and Chattanooga and are duplicates, being 70 ft. long, 18 ft. beam, and 15 ft. deep.

The steamer Moreland, building at the Lorain yard of the American Ship Building Co. for Jones & Laughlin, of Pittsburg, will be launched on June 16.

The Ann Arbor Railroad Co. has given contract to the Toledo Ship Building Co. for a car ferry to be 330 ft. keel, 56 ft. beam and 21 ft. deep.

ORE SHIPMENTS DURING JUNE.

Ore shipments during June were 7,316,592 tons, an increase of 1,923,337 tons during June 1909, when 5,393,255 tons were moved. This brings the total shipments to July 1 to 14,918,258 tons, an increase of 6,215,935 tons over the 1909 movement. It will be recalled that over 42,500,000 tons were moved during 1909, so that the 1910 movement is likely to exceed the predicted 50,000,000 tons. Following are the shipments arranged by ports:

Port.	June, 1909.	June, 1910.
Escanaba	747,377	767,618
Marquette	287,127	533,358
Ashland	371,169	708,248
Superior	856,062	1,321,877
Duluth	1,968,800	2,567,077
Two Harbors	1,162,720	1,418,414
Total	5,393,255	7,316,592
1910 increase		1,923,337

	To July 1, 1909.	To July 1, 1910.
Escanaba	1,132,233	1,739,735
Marquette	420,224	1,150,244
Ashland	612,024	1,515,555
Superior	1,464,577	2,632,835
Duluth	3,184,725	5,097,262
Two Harbors	1,888,540	2,782,627
Total	8,702,323	14,918,258
1910 increase		6,215,935

BLUE BOOK OF AMERICAN SHIPPING.

The 1910 edition of the Blue Book of American Shipping is just off the press. This is the standard marine directory of the United States, giving particulars of all vessels on the Atlantic and Pacific seaboards, the great lakes, and leading rivers. It also gives the names and addresses of the managing owners of the vessels and is, therefore, extremely useful to all those who desire to reach this trade in the way of business. Aside from the general classification the fleets have been assembled under their individual owners so that any manufacturer, banker or merchant can readily determine the number of vessels owned by each individual or company. Lists are also published of the ship and engine builders of the United States and Canada, as well as dry dock and repair yards. There is also published a directory of naval architects and marine engineers, admiralty lawyers and ship chandlers. A compendium is also given of all the steamship lines of the United States, both foreign and domestic.

A feature of particular interest, especially for the railroads, are statistics dealing with the commerce of the great lakes, especially in relation to iron ore and coal. The Blue Book is a complete directory of the great iron mining interests of the Lake Superior country, giving lists of all operators, shippers, agents, with complete data of both shipping and receiving docks. A list is also given of all the coal docks on the great lakes.

The intention has been to publish a directory that would facilitate anyone in reaching the marine and co-related trades. The Blue Book is published by the Penton Publishing Co., Cleveland, O. The price is $5, carriage prepaid anywhere on earth.

SUBMARINE SIGNALING.

Prof. Lucien I. Blake gave an interesting talk on Submarine Signaling at the Colorado Electric Club luncheon, June 23. The unreliability of air was contrasted with the reliability of water or solids as mediums for sound waves. He described the variation in distances in sunshine and darkness at which sounds of equal density can be heard, explaining about "zones of silence," "picking up sounds along the water," etc. None of these variations, he stated, affect submarine signaling. The whole difficulty was to obtain the proper transmitter making audible and clear the vibrations under water, and then to develop the water microphone, which was really the easier part of the problem. The equipment of lightships, trans-Atlantic steamers, etc., with signaling and receiving devices has made travel almost infinitely safer in fogs and storms than before. The signals are reliable at 15 miles, which is outside of the necessary distance. Both direction and distance can be determined from the character of the sound, and its intensity, and the number of strokes indicate the point on the international map. While considerably more restricted in its zone than wireless telegraphy, he considered that subaqueous signaling is at present in a much more perfected state and applied to a much more generally useful field.

ACCIDENT ON THE OHIO.

While taking south a fleet of coal boats and barges, the steamers Henry Lourey and Rover, of the Monongahela River Consolidated Coal & Coke Co., met with an accident June 8, near Lock No. 2, in the Ohio river. The Rover was sunk. Four coal boats out of a

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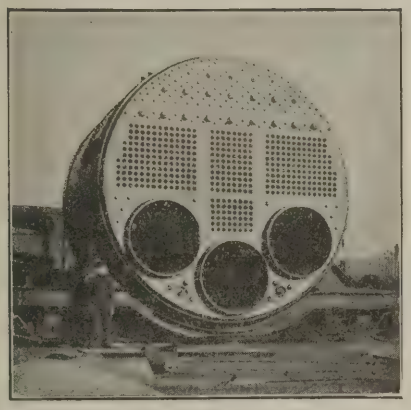

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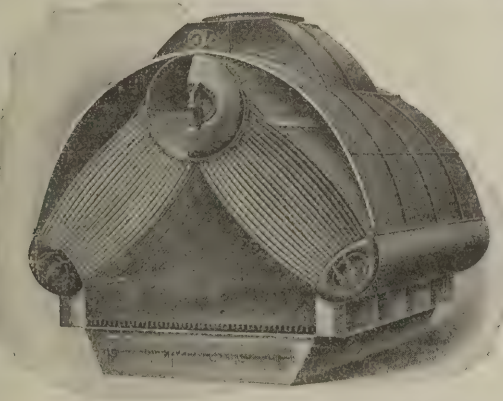

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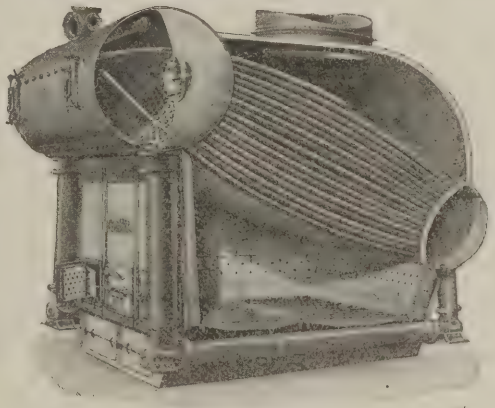

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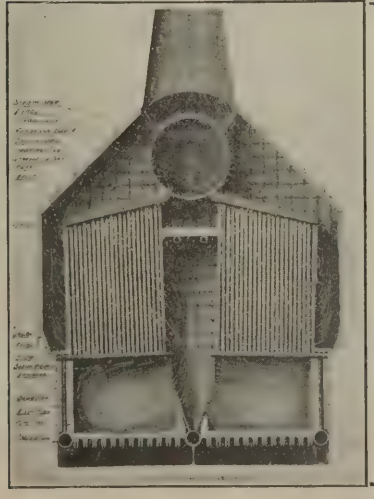

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Perfect Combustion --- Light Weight --- Greatest Efficiency

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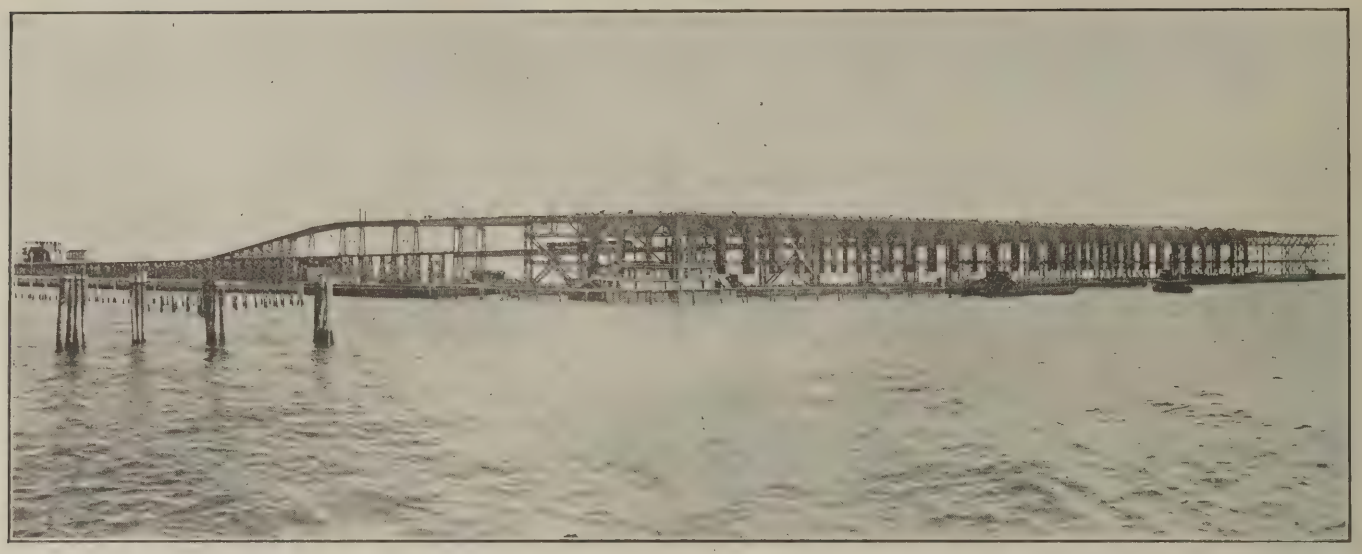

NEW COALING PIER OF THE VIRGINIAN RAILWAY CO. AT SEWELL'S POINT, VA.
For description see Marine Review for May.

tow of eight, two barges and two flats, containing 100,000 bu. of coal also were sunk. The Lourey, which was pushing the tow, escaped damage. The Rover had been sent out as a helper to the Lourey and after passing Dam No. 2, was placed at the head of the tow. The force of the current and the Lourey coming behind caused the Rover to overturn, and the four coal boats at the head of the tow buckled and went down. The rest of the tow, breaking loose, scattered and floated down the river, grounding at various points. The crew of 14 on the Rover lost everything but the clothes they were wearing and had a narrow escape from death. The accident occurred near the point where the tow boats Tom Dodsworth and Boaz lost 16 barges of coal on June 7.

ITEMS OF INTEREST.

The naval harbor of Dover, which has been in the course of construction for eleven years and has cost about $20,000,000, was formally opened on Oct. 15 by the Prince of Wales. The harbor comprises an area of nearly 700 acres formerly embraced in the open sea.

The Navy Department has decided to equip both the Wyoming and Arkansas with Parsons turbines. It was the original intention to equip the Wyoming, to be built by Cramps, with reciprocating engines.

W. A. Hengstenberg has been appointed secretary and general manager of the Seneca Chain Co., Kent, O. and will have charge of the plants at Kent and Mansfield. Mr. Hengstenberg was until recently the vice-president of the Newhall Chain Forge & Iron Co. of New York.

The Submarine Signal Co., 88 Broad street, Boston, in its Bulletin No. 35 announced that submarine signaling apparatus has been installed on 550 vessels, which is an increase of 24 per cent since April 1. The bulletin also announces that the electric bell which was located at Point Detour light at the entrance to St. Marys river was moved Sept. 7, 1909, to a point 2,000 ft. S E by E ¼ E from its former position and now lies sextant angles Espanore Island and Frying Pan light 92° 22′, Frying Pan light and Detour light 50° 7′, Detour light and Point St. Vidal 54° 33′.

The Morning Star, operated by the San Juan Navigation Co. between Seattle and points in the San Juan islands, has been converted into a passenger boat with accommodations for about 40 persons. She was originally designed for a missionary boat with small cabins like an ocean steamship. The redesign of her decks by McAllister & Bennett, Seattle, quarters the crew below decks, adds a Texas deck with staterooms and the captain's quarters forward, and provides a number of staterooms on the main deck.

SUMMARY OF NAVAL CONSTRUCTION.

The monthly summary of naval construction, issued by the bureau of construction and repair, shows the following progress upon vessels:

Name of Vessel—	Building at—	—1910— Per Cent of Completion. May 1.	June 1.
BATTLESHIPS.			
Florida	Navy Yard, New York	63.4	66.3
Utah	New York S. B. Co.	72.0	76.0
Wyoming	Wm. Cramp & Sons	19.0	22.5
Arkansas	New York S. B. Co.	24.0	27.6
TORPEDO BOAT DESTROYERS.			
Paulding	Bath Iron Works	86.8	89.4
Drayton	Bath Iron Works	77.6	82.5
Roe	Newport News S. B. Co.	85.1	88.7
Terry	Newport News S. B. Co.	82.4	86.9
Perkins	Fore River S. B. Co.	72.9	79.6
Sterrett	Fore River S. B. Co.	71.4	77.1
McCall	New York S. B. Co.	66.9	76.5
Burrows	New York S. B. Co.	65.6	72.7
Warrington	Wm. Cramp & Sons	67.5	68.3
Mayrant	Wm. Cramp & Sons	72.6	73.9
Monaghan	Newport News S. B. Co.	18.3	19.9
Trippe	Bath Iron Works	31.9	38.8
Walke	Fore River S. B. Co.	27.5	32.1
Ammen	New York S. B. Co.	30.9	40.4
Patterson	Wm. Cramp & Sons	17.8	23.0
SUBMARINE TORPEDO BOATS.			
Cannon	Fore River S. B. Co.	92.7	94.7
Carp	Union Iron Works	47.6	53.5
Barracuda	Union Iron Works	47.6	53.5
Pickerel	The Moran Co.	46.4	50.4
Skate	The Moran Co.	46.1	50.4
Skipjack	Fore River S. B. Co.	37.6	40.1
Sturgeon	Fore River S. B. Co.	36.7	38.9
Thrasher	Wm. Cramp & Sons	4.7	5.7
Tuna	Newport News S. B. Co.	22.2	26.2
Seal	Newport News S. B. Co.	48.9	50.1
COLLIERS.			
Cyclops	Wm. Cramp & Sons	70.6	74.8
No. 8	Maryland Steel Co.	23.3	28.23

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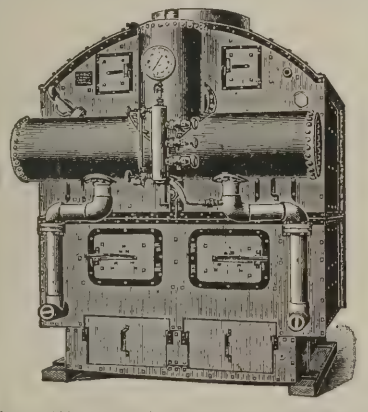

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STEAMER L. C. HANNA'S PLIGHT.

The steamer Leonard C. Hanna had the misfortune to run ashore on the outer edge of Kettle Point at the foot of Lake Huron during a dense fog caused by smoke, on Sunday morning, July 3. This location is about as nasty a one upon which to strand as is to be found on the chain of lakes, as the rocky ledge extends for several miles into the lake and is entirely exposed. Heavy seas would speedily do great damage to a steamer stranded there. The Hanna was released after the Favorite had jettisoned 4,000 tons of her ore cargo. She was released before the lighter Rescue reached her. The steamer's No. 1, 2, 3 and 4 tanks were filled with water and her bottom was in bad shape. Two air compressors and a pump were placed aboard her and she proceeded to Cleveland, where she unloaded the balance of her cargo. She was docked at Lorain, where it was discovered that forty bottom plates were damaged and several frames broken.

THE STEAMER L. C. HANNA ON THE ROCKS OFF KETTLE POINT, LAKE HURON, WITH THE WRECKER FAVORITE ALONGSIDE.

TRADE NOTES.

The George Stratford Oakum Co., Jersey City, N. J., has just issued a calendar, the pictorial part of which is a reproduction of an excellent photograph of the non-magnetic yacht Carnegie.

The Chicago Pneumatic Tool Co., Chicago, has just issued a bulletin descriptive of the Franklin tandem gasoline engine-driven air compressors. They are high speed compressors and are claimed to be reliable and efficient.

The British Corporation for the Survey and Registry of Shipping of Glasgow, after exhaustive tests has sanctioned the use of Thermit process for repairs to fractured stern posts, lower portions of rudder frames and damages of a similar character.

The Williamsport Gas Engine Works have reopened the plant of the Williamsport Gas Engine Co. which has been shut down during the past year, and will continue the entire line of gas and gasoline engines formerly manufactured by the old company.

The American Specialty Co., of Chicago, has recently been appointed sole export agent for the line of portable electric drilling machines manufactured by the Van Dorn Electric & Mfg. Co., Cleveland. The American Specialty Co. also has the agency for these tools in the Chicago and central western districts.

John D. McRae, Oswego, N. Y., has sent out announcements to the effect that the Morison and Fox corrugated furnaces made by Schulz Knaudt, the largest makers in the world, can now be furnished for marine and stationary purposes and are guaranteed to meet all government requirements. Inquiries concerning the furnaces are solicited.

The H. W. Johns-Manville Co., 100 William street, New York, has just issued a bulletin on pipe coverings for various purposes. Efficient pipe coverings are fuel savers, the company claiming to have made as large as an 85 per cent reduction in the fuel burned in some plants where the pipes were formerly bare, and as large as 26 per cent where pipes were already supposed to be insulated.

The Dixon Co. recently took up a belt in its mill rooms for the first time in eighteen years. For eighteen years about thirty belts in that room have been run constantly. The belts are about 25 ft. in length and 6 in. in width and have run satisfactorily for eighteen years without breakage. The belts are regularly treated with Dixon's traction belt dressing which the Dixon company claims is one of the very best leather preservatives.

A little booklet of twenty-four pages under the above title has just been gotten out by the Joseph Dixon Crucible Co. As the name indicates it deals with the use of graphite about the ship, and points out the advantages that graphite offers as a lubricant for various parts of machinery. The booklet specifically deals with the lubrication of marine engines, thrust and stern bearings. The information is specially valuable because of its definiteness, the booklet describing exactly how graphite is applied for the purposes mentioned.

A fertile source of fire in manufacturing, power and similar industrial establishments is oil—not illuminating oil, but that used for lubricating purposes. The impossibility of absolutely confining oil within any but the most exquisitely ground type of bearing results in a goodly amount of oil dripping or splashing out of the bearing and on to the floor. If the latter is of concrete, the oil saturates it, thereby weakening the mass and making the floor unsafe. If the floor is of wood, the dripping oil renders it highly inflammable. Only a spark is needed to start combustion. That fire insurance companies recognize this fact is evidenced by the higher rate charged on buildings containing oil-lubricated machinery than on buildings housing machinery lubricated with plastic lubricants, grease, for instance. The ability of grease to "stay where it is put," to use an apt phrase employed by Adam Cook's Sons, manufacturers of "Albany Grease," prevents either splashing or dripping of the lubricant. Consequently, the fire risk is considerably decreased, to say nothing of the considerably increased cleanliness secured. One of the reasons for the widespread use of "Albany Grease" is the recognition by thoughtful engineers of the freedom from fire risk that its use insures.

PROPOSALS.—SALE OF U. S. S. HORNET.—Sealed proposals will be received at the Navy Department until noon of July 12, 1910, at which time and place they will be opened for the purchase of the U. S. S. Hornet, which may be examined at any time after the date hereof by applying to the Commandant, Navy Yard, Norfolk, Va. The vessel will be sold for cash to the highest bidder regardless of its appraised value, which is $7,000. Prospective bidders should apply to the Navy Department for forms of bids and bonds, together with terms and conditions of sale; also a printed list giving general information to bidders. The Department reserves the right to withdraw the vessel from sale and to reject any or all bids. Beekman Winthrop, Assistant Secretary of the Navy.

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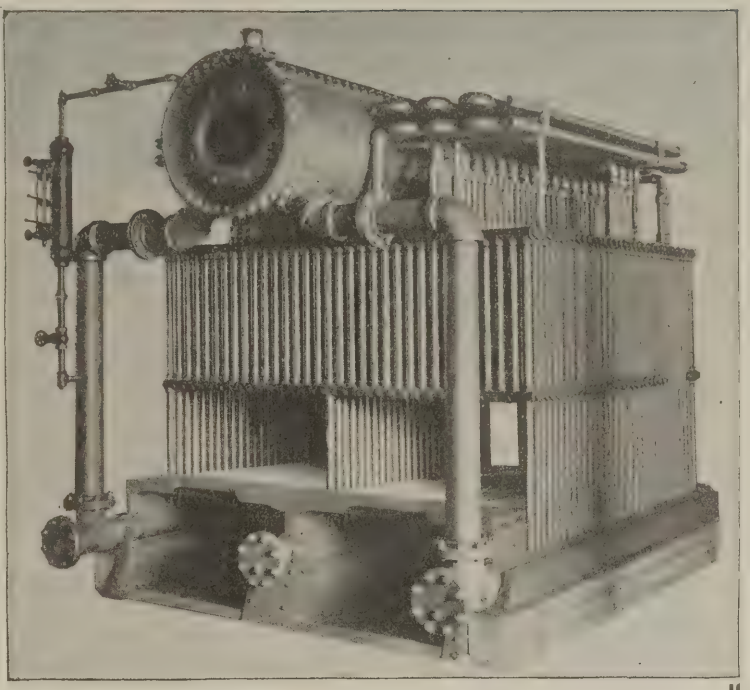
has some very important features which are not found in any other water tube boiler.

These features are a fire box, combustion chamber, and horizontal flue pass similar to those of the Scotch Marine Boiler. These features give it a great advantage over other water tube boilers and when combined with the great amount of heating surface which it contains, make it far easier on coal than any other boiler made.

The Short Vertical Tubes maintain positive heads of water on all parts exposed to the fire and make injury from burning impossible. In actual service in commercial steamers, the boiler has proved more durable than the Scotch Marine. It is far more economical; it is light, powerful and easily repaired in any of its parts. It has no equal for passenger steamers, tugs, etc. Catalog giving full description, drawings and reports sent on request.



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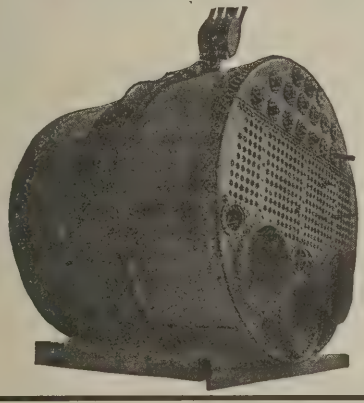

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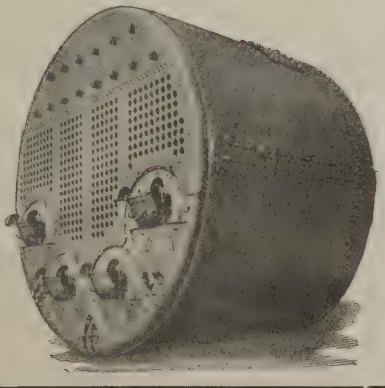

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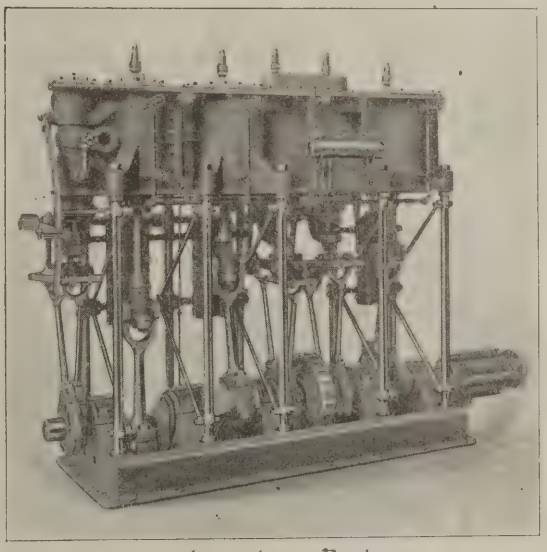

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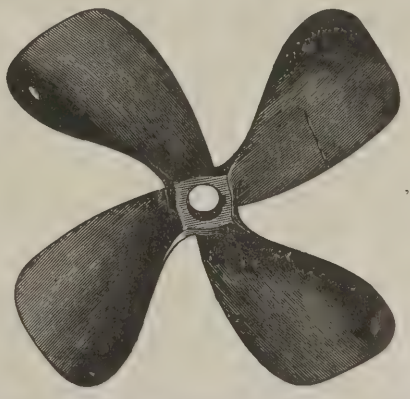

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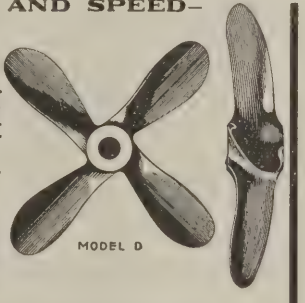

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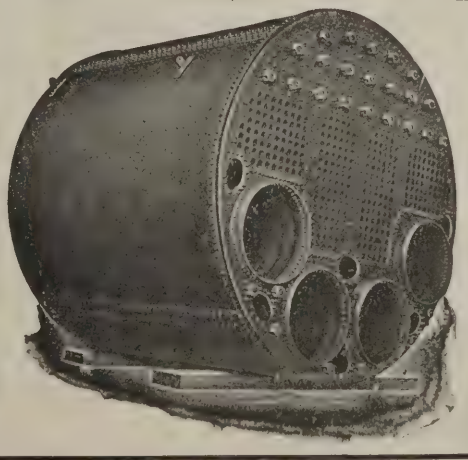

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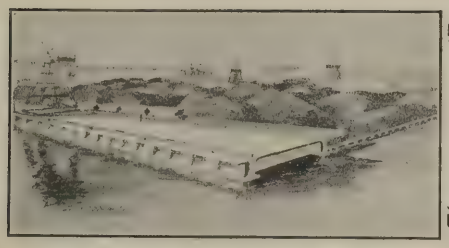

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Stephens-Adamson Mfg. Co., Aurora, Ill.

CORDAGE.
Baker & Co., H. H., Buffalo, N. Y.
Columbian Rope Co., Auburn, N. Y.
Erie Mill & Marine Supply Co., Buffalo, N. Y.
Upson-Walton Co., Cleveland, O.

COUPLINGS.
National Tube Co., Pittsburg, Pa.

CRANES.
Brown Hoisting Machinery Co., Cleveland, O.
General Electric Co., Schenectady, N. Y.

CRANES (Dock).
Brown Hoisting Machinery Co., Cleveland, O.
Williamson Brothers Co., Philadelphia, Pa.

CRANES (Electric Boat).
Williamson Brothers Co., Philadelphia, Pa.

CRANES (Electric Traveling).
Brown Hoisting Machinery Co., Cleveland, O.

CRANES (Gantry).
Brown Hoisting Machinery Co., Cleveland, O.

CRANES (Hand Traveling).
Brown Hoisting Machinery Co., Cleveland, O.

CRANES (Locomotive).
Brown Hoisting Machinery Co., Cleveland, O.
Williamson Brothers Co., Philadelphia, Pa.

CRANES (Pneumatic).
Brown Hoisting Machinery Co., Cleveland, O.

CUPS (Oil and Grease)
Michigan Lubricator Co., Detroit, Mich.
Penberthy Injector Co., Detroit, Mich.

CUTTERS (Pipe).
Armstrong Mfg. Co., Bridgeport, Conn.

DAVITS.
Lundin, A. P., New York, N. Y.

DERRICKS.
Dake Engine Co., Grand Haven, Mich.
Hayward Co., New York City.

DESIGNERS (Ship).
Babcock & Penton, Cleveland, O.
Curr, Robt., Cleveland, O.
Ekstrom, G., Detroit, Mich.
Furstenau, M. C., Philadelphia, Pa.
Kidd, Joseph, Duluth, Minn.
Nacey & Hynd, Cleveland, O.
Nevins & Smith, Chicago, Ill., and Cleveland, O.
Wilby, Carlton, Detroit, Mich.
Wood, W. J., Chicago, Ill.

DIES.
Armstrong Mfg. Co., Bridgeport, Conn.

DIVERS.
Donnelly Salvage & Wrecking Co., Ltd., Kingston, Ont.
Normand & Co., Cleveland, O.

DIVING APPARATUS.
Morse, A. J., & Son, Boston, Mass.
Schrader's Son, Inc., A., New York, N. Y.

DRAFT (Artificial and Mechanical for Boilers).
American Ship Building Co., Cleveland, O.
Detroit Ship Building Co., Detroit, Mich.
Great Lakes Engineering Wks., Detroit, Mich.

DOCKS (Dry).
American Ship Building Co., Cleveland, O.
Buffalo Dry Dock Co., Buffalo, N. Y.
Chicago Ship Building Co., Chicago, Ill.
Collingwood Ship Building Co., Collingwood, Ont.
Detroit Ship Building Co., Detroit, Mich.
Empire Ship Building Co., Buffalo, N. Y.
Great Lakes Engineering Works, Detroit, Mich.
Manitowoc Dry Dock Co., Manitowoc, Wis.
Maryland Steel Co., Sparrow's Point, Md.
Milwaukee Dry Dock Co., Milwaukee, Wis.
Moran Co., Seattle, Wash.
Newport News Ship Building Co., Newport News, Va.
Superior Ship Building Co., Superior, Wis.
Tietjen & Lang Dry Dock Co., Hoboken, N. J.
Toledo Ship Building Co., Toledo, O.

DROPS (Wharf).
American Ship Windlass Co., Providence, R. I.

DYNAMOS.
General Electric Co., Schenectady, N. Y.

EJECTORS.
Penberthy Ejector Co., Detroit, Mich.

EJECTORS (Ash).
Great Lakes Engineering Wks., Detroit, Mich.

ENGINEERS.
(Marine, Mechanical and Consulting.)
Babcock & Penton, Cleveland, O.
Ekstrom, G., Detroit, Mich.
Furstenau, M. C., Philadelphia, Pa.
Hunt, Robt. W., & Co., Chicago, Ill.
Kidd, Joseph, Duluth, Minn.
Maryland Steel Co., Sparrow's Point, Md.
Nacey & Hynd, Cleveland, O.
Nevins & Smith, Chicago, Ill.; Cleveland, O.
Roelker, H. B., New York, N. Y.
Wilby, Carlton, Detroit, Mich.
Wood, W. J., Chicago, Ill.

ENGINES (Deck).
Chase Machine Co., Cleveland, O.
Williamson Brothers Co., Philadelphia, Pa.

ENGINES (Hoisting).
American Blower Co., Detroit, Mich.
Chase Machine Co., Cleveland, O.
Lidgerwood Mfg. Co., New York, N. Y.
Marine Iron Co., Bay City, Mich.
Williamson Brothers Co., Philadelphia, Pa.

ENGINES (Marine).
American Blower Co., Detroit, Mich.
American Ship Building Co., Cleveland, O.
Briggs, Marvin, New York, N. Y.
Chicago Ship Building Co., Chicago, Ill.
Chase Machine Co., Cleveland, O.
Clyde Ship Building & Eng'g Co., Port Glasgow, Scotland.
Collingwood Ship Building Co., Collingwood, Ont.
Detroit Ship Building Co., Detroit, Mich.
Fletcher, W. & A., Co., Hoboken, N. J.
Fore River Ship Building Co., Quincy, Mass.
Gillett & Eaton, Lake City, Minn.
Great Lakes Engineering Wks., Detroit, Mich.
Johnston Bros., Ferrysburg, Mich.
Manistee Iron Works Co., Manistee, Mich.
Manitowoc Dry Dock Co., Manitowoc, Wis.
Maryland Steel Co., Sparrow's Point, Md.
Milwaukee Dry Dock Co., Milwaukee, Wis.
Moran Co., Seattle, Wash.
Newport News Ship Building Co., Newport News, Va.
New York Ship Building Co., Camden, N. J.
Sheriffs Mfg. Co., Milwaukee, Wis.
Superior Ship Building Co., Superior, Wis.
Toledo Ship Building Co., Toledo, O.
Trout, H. G., Buffalo, N. Y.
Ward, Chas., Engineering Works, Charleston, W. Va.

ENGINES (Mooring).
Chase Machine Co., Cleveland, O.
Williamson Brothers Co., Philadelphia, Pa.

ENGINES (Steering).
Century Engrg. Co., Ogdensburg, N. Y.
Williamson Brothers Co., Philadelphia, Pa.

FASTENERS (Hatch).
Lundin, A. P., New York, N. Y.
Nacey & Hynd, Cleveland, O.

FILTERS (Feed Water).
Ross Valve Mfg. Co., Troy, N. Y.

FITTINGS (Boiler).
National Tube Co., Pittsburg, Pa.

FITTINGS (Pipe).
National Tube Co., Pittsburg, Pa.

FIXTURES.
(Lamp, Oil and Electric.)
General Electric Co., Schenectady, N. Y.

FORGING.
(Crank, Propeller or Thrust).
Fore River Ship Building Co., Quincy, Mass.

FUELING COMPANIES AND COAL DEALERS.
Hall, Geo., Coal Co., Ogdensburg, N. Y., and Montreal, Can.
Hanna & Co., M. A., Cleveland, O.
Lorain Coal & Dock Co., Lorain, O.
Parker Bros. Co., Ltd., Detroit, Mich.
Pickands, Mather & Co., Cleveland, O.
Pittsburg Coal Co., Cleveland, O.
Smith & Co., Stanley B., Detroit, Mich.
Toledo Fuel Co., Toledo, O.

FURNACES (for Boilers).
Ballin Water Tube Boiler Co., Portland, Ore.
Continental Iron Works, New York, N. Y.

GAGES (Water).
Michigan Lubricator Co., Detroit, Mich.
Penberthy Injector Co., Detroit, Mich.

GEARS (Steering).
Akers Steering Gear Co., Chicago, Ill.
American Ship Building Co., Cleveland, O.
American Ship Windlass Co., Providence, R. I.
Chase Machine Co., Cleveland, O.
Dake Engine Co., Grand Haven, Mich.
Detroit Ship Building Co., Detroit, Mich.
Hyde Windlass Co., Bath, Me.
Sheriffs Mfg. Co., Milwaukee, Wis.
Standard Chain Co., Pittsburg, Pa.

GENERATORS.
General Electric Co., Schenectady, N. Y.

GRAPHITE.
Dixon Crucible Co., Joseph, Jersey City, N. J.

GRAPHITE (Lubricating).
Dixon Crucible Co., Joseph, Jersey City, N. J.

GYPSEYS (Steam).
American Ship Windlass Co., Providence, R. I.

HAMMERS (Steam).
Chase Machine Co., Cleveland, O.

HARDWARE (Marine).
Baker & Co., Howard H., Buffalo, N. Y.
Erie Mill & Marine Supply Co., Buffalo, N. Y.
Lundin, A. P., New York City.
Upson-Walton Co., Cleveland, O.

HEATERS AND PURIFIERS
(Feed-Water).
Ross Valve Mfg. Co., Troy, N. Y.

HOISTERS (Ferrall's Cargo).
Boston & Lockport Block Co., E. Boston, Mass.

HOISTS (Air).
Great Lakes Engineering Wks., Detroit, Mich.

HOISTS (Cargo, Etc.)
American Ship Building Co., Cleveland, O.
Boston & Lockport Block Co., E. Boston, Mass.
Brown Hoisting Machinery Co., Cleveland, O.
Chase Machine Co., Cleveland, O.
Chisholm & Moore Mfg. Co., Cleveland, O.
Dake Engine Co., Grand Haven, Mich.
General Electric Co., New York, N. Y.
Hyde Windlass Co., Bath, Me.
Williamson Brothers Co., Philadelphia, Pa.

HOISTS (Chain).
Chisholm & Moore Mfg. Co., Cleveland, O.
Dake Engine Co., Grand Haven, Mich.

HOISTS (Electric).
Brown Hoisting Machinery Co., Cleveland, O.
General Electric Co., Schenectady, N. Y.
Williamson Brothers Co., Philadelphia, Pa.

HOISTS (Pneumatic).
Brown Hoisting Machinery Co., Cleveland, O.
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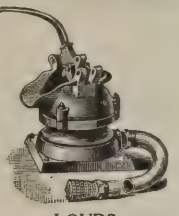

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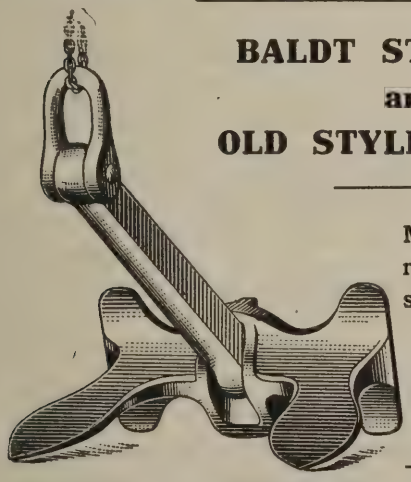

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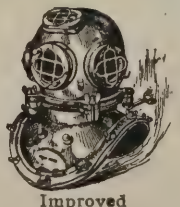

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Ritchie & Sons, E. S., Brookline, Mass.
Schuette Recording Compass Co., Manitowoc, Wis.

INSURANCE (Marine).

Belcher, Fred P., Winnipeg, Man.
Boland & Cornelius, Buffalo, N. Y.
Hawgood & Co., W. A., Cleveland, O.
Hutchinson & Co., Cleveland, O.
McCarthy, T. R., Montreal, Can.
McCurdy, Geo. L., Chicago, Ill.
Mehl, Edward, Erie, Pa.
O'Connor, J. J., Port Arthur, Ont.
Parker Bros. Co., Ltd., Detroit, Mich.
Richardson, W. C., Cleveland, O.
Sullivan & Co., D., Chicago, Ill.
Vance & Joys Co., Milwaukee, Wis.
Willcox, Peck & Hughes, New York, N. Y., Cleveland, O., Chicago, Ill.

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Hanna & Co., M. A., Cleveland, O.
Pickands, Mather & Co., Cleveland, O.

JACKETS (Cork).

Armstrong Cork Co., Pittsburg, Pa.
Kahnweiler's Sons, David, New York, N. Y.

JOINTS (Expansion).

National Tube Co., Pittsburg, Pa.

LAMPS AND LANTERNS (Ship).

Baker & Co., Howard H., Buffalo, N. Y.
Erie Mill & Marine Supply Co., Buffalo, N. Y.
Upson-Walton Co., Cleveland, O.

LAMPS (Arc).

General Electric Co., Schenectady, N. Y.

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Drein, Thos., & Son Co., Wilmington, Del.
Lundin, A. P., New York, N. Y.

LIGHTS (Electric).

Cory & Son, Chas., New York, N. Y.
General Electric Co., Schenectady, N. Y.

LIGHTS (Search).

General Electric Co., Schenectady, N. Y.

LOGS.

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Nicholson Ship Log Co., Cleveland, O.
Schuette Recording Compass Co., Manitowoc, Wis.
Walker & Sons, Thomas, Birmingham, Eng.

LUBRICATORS.

Michigan Lubricator Co., Detroit, Mich.
Penberthy Injector Co., Detroit, Mich.

LUMBER.

Martin-Barriss Co., Cleveland, O.

MACHINERY. (Coal and Ore Handling.)

Bartlett, C. O., & Snow Co., Cleveland, O.
Brown Hoisting Machinery Co., Cleveland, O.
Hayward Co., New York, N. Y.

MACHINERY (Dredging).

Chase Machine Co., Cleveland, O.
Hayward Co., New York City.
Superior Iron Works, Superior, Wis.
Williamson Brothers Co., Philadelphia, Pa.

MACHINERY (Ice).

Great Lakes Engineering Wks., Detroit, Mich.
Roelker, H. B., New York, N. Y.

MACHINERY (Marine).

American Ship Building Co., Cleveland, O.
Chase Machine Co., Cleveland, O.
Chicago Ship Building Co., Chicago, Ill.
Clyde Ship Building & Engineering Co., Port Glasgow, Scotland.
Collingwood Ship Building Co., Collingwood, Ont.
Dake Engine Co., Grand Haven, Mich.
Detroit Ship Building Co., Detroit, Mich.
Empire Ship Building Co., Buffalo, N. Y.
Fore River Ship Building Co., Quincy, Mass.
Fletcher Co., W. & A., Hoboken, N. J.
Gillett & Eaton, Lake City, Minn.
Great Lakes Engineering Works, Detroit, Mich.
Johnston Bros., Ferrysburg, Mich.
Manistee Iron Works, Manistee, Mich.
Manitowoc Dry Dock Co., Manitowoc, Wis.
Moran Co., The, Seattle, Wash.
Newport News Ship Building & Dry Dock Co., Newport News, Va.
New York Ship Building Co., Camden, N. J.
Sheriffs Mfg. Co., Milwaukee, Wis.
Superior Iron Works Co., Superior, Wis.
Toledo Ship Building Co., Toledo, O.

MACHINERY (Paddle-Wheel Boat).

Gillett & Eaton, Lake City, Minn.

MACHINES (Towing).

American Ship Windlass Co., Providence, R. I.
Chase Machine Co., Cleveland, O.

MACHINISTS.

Chase Machine Co., Cleveland, O.
Superior Iron Works, Superior, Wis.

MOTORS AND GENERATORS. (Electric).

General Electric Co., Schenectady, N. Y.

MOTORS (Winch).

General Electric Co., Schenectady, N. Y.

OAKUM.

Davey, W. O., & Sons, Jersey City, N. J.
Stratford Oakum Co., Geo., Jersey City, N. J.

OILS AND LUBRICANTS.

Dixon Crucible Co., Joseph, Jersey City, N. J.

ORE (Iron).

Hanna & Co., M. A., Cleveland, O.
Pickands, Mather & Co., Cleveland, O.

PACKING.

Home Rubber Co., Trenton, N. J.
Jenkins Bros., New York, N. Y.
Johns-Manville Co., H. W., New York, N. Y.
Katzenstein, L., & Co., New York, N. Y.
Revere Rubber Co., Boston, Mass.

PACKING (Metallic).

Katzenstein, L., & Co., New York, N. Y.

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Gillett & Eaton, Lake City, Minn.

PATENTS.

Siggers & Siggers, Washington, D. C.

PAINTS AND VARNISHES.

Baker, Howard H., & Co., Buffalo, N. Y.
Berry Bros., Ltd., Detroit, Mich.
Upson-Walton Co., Cleveland, O.

PIPE.

National Tube Co., Pittsburg, Pa.

PLANTS (Electric Light and Power).

General Electric Co., Schenectady, N. Y.

PLATES AND SHAPES (Ship and Boiler).

Otis Steel Co., Ltd., Cleveland, O.

PLATES (Ship, Structural, Etc.).

Otis Steel Co., Ltd., Cleveland, O.

POSTS (Tow).

Montague Iron Works Co., Montague, Mich.

PRESERVERS. (Life, Life Boats, Buoy, Etc.).

Armstrong Cork Co., Pittsburg, Pa.
Drein, Thos., & Son, Wilmington, Del.
Kahnweiler's, David, Sons, New York, N. Y.
Lundin, A. P., New York, N. Y.

PROJECTORS (Electric).

General Electric Co., Schenectady, N. Y.

PUMPS AND APPLIANCES (Air).

Fore River Ship Building Co., Quincy, Mass.
Great Lakes Engineering Wks., Detroit, Mich.
Kingsford Fdry. & Mch. Co., Oswego, N. Y.

PUMPS (Steam).

Donnelly Salvage & Wrecking Co., Ltd., Kingston, Ont.

PUMPS (For Various Purposes).

Great Lakes Engineering Wks., Detroit, Mich.
Kingsford Fdry. & Mch. Co., Oswego, N. Y.
Michigan Lubricator Co., Detroit, Mich.
Roelker, H. B., New York, N. Y.

RADIATORS.

National Tube Co., Pittsburg, Pa.

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American Ship Building Co., Cleveland, O.
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Chicago Ship Building Co., So. Chicago, Ill.
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Detroit Ship Building Co., Detroit, Mich.
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Bartlett, C. O., & Snow Co., Cleveland, O.

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Otis Steel Co., Ltd., Cleveland, O.

SHEAVES.

Boston & Lockport Block Co., E. Boston, Mass.

SHIPS (Builders).

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Buffalo Dry Dock Co., Buffalo, N. Y.
Clyde Ship Building & Eng'g Co.,
Port Glasgow, Scotland.
Collingwood Ship Building Co.,
Collingwood, Ont.
Chicago Ship Building Co., Chicago, Ill.
Cowles Shipyard, Benj. L., Buffalo, N. Y.
Detroit Ship Building Co., Detroit, Mich.
Empire Ship Building Co., Buffalo, N. Y.
Fletcher Co., N. & A., Hoboken, N. J.
Fore River Ship Building Co., Quincy, Mass.
Great Lakes Engineering Works, Detroit, Mich.
Johnston Bros., Ferrysburg, Mich.
Manitowoc Dry Dock Co., Manitowoc, Wis.
Maryland Steel Co., Sparrow's Point, Md.
Milwaukee Dry Dock Co., Milwaukee, Wis.
Moran Co., Seattle, Wash.
Newport News Ship Building Co.,
Newport News, Va.
New York Ship Building Co., Camden, N. J.
Superior Ship Building Co.,
West Superior, Wis.
Tietjen & Lang Dry Dock Co.,
Hoboken, N. J.
Toledo Ship Building Co., Toledo, O.

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Penberthy Injector Co., Detroit, Mich.
Nacey & Hynd, Cleveland, O.
Ross Valve Mfg. Co., Troy, N. Y.

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Erie Mill & Marine Supply Co., Buffalo, N. Y.
Jenkins Bros., New York, N. Y.
Michigan Lubricator Co., Detroit, Mich.
National Tube Co., Pittsburg, Pa.
Penberthy Injector Co., Detroit, Mich.
Ross Valve Mfg. Co., Troy, N. Y.

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International Mercantile Marine Co.,
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Red Star Line, New York, N. Y.

STOCKS.

Armstrong Mfg. Co., Bridgeport, Conn.

STOKERS.

American Ship Windlass Co., Providence, R. I.
Underfeed Stoker Co. of America, Chicago, Ill.

STOPPERS (Chain).

American Ship Windlass Co., Providence, R. I.

SUPPLIES (Fire Department).

Morse & Son, Inc., Andrew, Boston, Mass.
Parker Bros. Co., Ltd., Detroit, Mich.
Nacey & Hynd, Cleveland, O.

SUPPLIES (Marine).

Baker, Howard H., & Co., Buffalo, N. Y.
Erie Mill & Marine Supply Co., Buffalo, N. Y.
Upson-Walton Co., Cleveland, O.

SURVEYORS (Marine).

Babcock & Penton, Cleveland, O.
Curr, Robert, Cleveland, O.
Ekstrom, G., Detroit, Mich.
Furstenau, M. C., Philadelphia, Pa.
Hunt & Co., Robt. W.,
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Kidd, Joseph, Duluth, Minn.
Parker Bros. Co., Ltd., Detroit, Mich.
Nacey & Hynd, Cleveland, O.
Nevins & Smith, Chicago, Ill.; Cleveland, O.
Wilby, Carlton, Detroit, Mich.
Wood, W. J., Chicago, Ill.

SWITCHBOARDS.

General Electric Co., Schenectady, N. Y.

TANKS.

National Tube Co., Pittsburg, Pa.

TESTS OF MATERIALS.

Babcock & Penton, Cleveland, O.
Curr, Robert, Cleveland, O.
Ekstrom, G., Detroit, Mich.
Furstenau, M. C., Philadelphia, Pa.
Hunt, Robt. W., & Co.,
Chicago, Ill., and New York, N. Y.
Kidd, Joseph, Duluth, Minn.
Nacey & Hynd, Cleveland, O.
Nevins & Smith,
Chicago, Ill., and Cleveland, O.
Wilby, Carlton, Detroit, Mich.
Wood, W. J., Chicago, Ill.

THERMIT.

Goldschmidt Thermit Co., New York, N. Y.

TIMBER (Ship).

Martin-Barriss Co., Cleveland, O.

TOWING COMPANIES.

Donnelly Salvage & Wrecking Co.,
Kingston, Ont.

TRAPS (Steam).

National Tube Co., Pittsburg, Pa.

TUBES.

National Tube Co., Pittsburg, Pa.

TUBING (Seamless).

National Tube Co., Pittsburg, Pa.

TUGS.

Donnelly Salvage & Wrecking Co., Ltd.,
Kingston, Ont.

TWINE AND YARN (Tarred Sisal).

Columbian Rope Co., Auburn, N. Y.

UNIONS.

National Tube Co., Pittsburg, Pa.

VALVES.

Ashton Valve Co., Boston, Mass.
Jenkins Bros., New York, N. Y.
Nacey & Hynd, Cleveland, O.
National Tube Co., Pittsburg, Pa.
Penberthy Injector Co., New York, N. Y.
Ross Valve Mfg. Co., Troy, N. Y.

VALVES (For Water and Gas).

Ashton Valve Co., Boston, Mass.
National Tube Co., Pittsburg, Pa.
Ross Valve Mfg. Co., Troy, N. Y.

VESSELS FOR SALE (Steam).

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Bunker, E. A., New York, N. Y.

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Fix's, S., Sons, Cleveland, O.

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Goldschmidt Thermit Co., New York, N. Y.

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Great Lakes Engineering Wks., Detroit, Mich.
Hyde Windlass Co., Bath, Me.
Milwaukee Dry Dock Co., Milwaukee, Wis.
Newport News Ship Building Co.,
Newport News, Va.
Roelker, H. B., New York, N. Y.
Sheriffs Mfg. Co., Milwaukee, Wis.
Superior Ship Building Co., Superior, Wis.
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American Ship Building Co., Cleveland, O.
American Ship Windlass Co., Providence, R. I.
Dake Engine Co., Grand Haven, Mich.
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American Ship Windlass Co., Providence, R. I.
Chase Machine Co., Cleveland, O.
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Steamboat Fueling Facilities at Various Points on the Great Lakes

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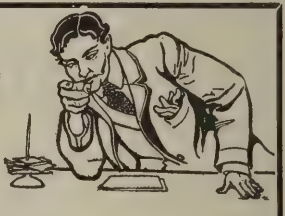
If FUEL COAL is needed on the St. Lawrence River



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BOUCHARD-KILLIAN RELEASING BLOCK

It is automatic—absolutely safe—needs no lashing and lets go at once when boat is water borne.

The Board of Supervising Inspectors of Steam Vessels approved this block Feb. 15, 1909.

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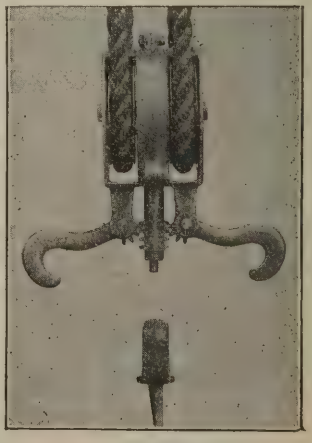

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LIGHTER CARRYING DIFFERENT GRADES AT ALL TIMES

Fuel Scow with elevators and discharging spouts. Storage of 800 tons. Discharges 250 tons an hour into steamers while unloading cargo.

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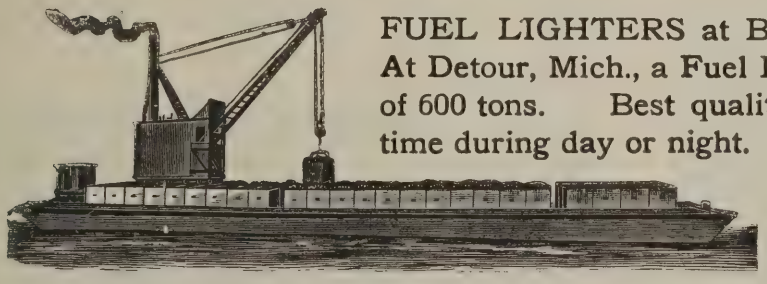

FUEL LIGHTERS at Buffalo, Erie, Ashtabula, Cleveland. At Detour, Mich., a Fuel Dock equipped with shute capacity of 600 tons. Best quality Pittsburg coal furnished at any time during day or night.

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For Sale---Miscellaneous

FOR SALE, OR TRADE FOR STEAM BARGE—STEAM TUG "J. J. Evans," 46 ft. long, 12½ ft. beam, depth 6 ft., gross tonnage 14, boiler 9½ x 5, engine 14 x 14, oak planking, good tower, ready for work. Price $2,000.00. Inquire of Owner, J. H. Riley, Menominee, Mich.

PASSENGER STEAMER CHEQUAMEGON FOR SALE, BUILT in 1903. Allowed 400 passengers. Triple-expansion engines, 175 lbs. steam pressure, 125 ft. overall, 22 ft. beam, electric lights, searchlight, steam steering gear, draught 8 ft. 10 in. Rated A1. Information and price from C. A. Webb, Traverse City, Mich.

FOR SALE AT A BARGAIN, AN ENGLISH BUILT SCOTCH type marine boiler, but little used. 13½ ft. diameter, 10½ ft. long, built for 180 lb. Inspected by Lloyds June 10, 1909, and allowed 180 lb. working pressure. Transportation to the lakes by canal. Original drawings can be seen by applying to B. F. Conway, 39 Cortlandt St., New York City.

FOR SALE CHEAP: LIGHT DRAUGHT SAND SUCKER, 86 ft. long, 20 ft. beam, 7 ft. deep, engine 10½ x 12, boiler altered, 112 pounds steam, equipped with 8 inch pump. The boat is now in Commission. For particulars address Box A, care THE MARINE REVIEW, Cleveland, O.

THE FREIGHT STEAMER YONKERS FOR SALE. 264 FT. 9 in. in length, 36 ft. 4 in. beam, depth 16 ft. 4 in., has two Steeple Compound Condensing Engines 20 x 40 cylinders, 2 Marine Fire Box Boilers, 8 ft. in diameter, 16 ft. long, allowed 100 pounds steam pressure, horse power of engines and boilers, 600. Gross tonnage 1,770, net tonnage 1,571. Hull is built of wood. Steamer carried grain last season, and is fully equipped ready to start up steam. Hull and machinery is in A-1 condition. Can be inspected in Buffalo. Address Jacob Ullman, 46 Lloyd street, Buffalo, N. Y.

FREIGHT STEAMER AUBURN FOR SALE. LENGTH, 258 ft. 8 in., beam, 35 ft. 9 in., depth, 16 ft. 2 in, 2 Steeple Compound Condensing Engines, 20x 40 cylinders, 2 Marine Fire Box Boilers, 18 ft. long, 8 ft. in diameter. Allowed 95 pounds steam pressure. Horsepower of engines and boilers, 600. Gross tonnage, 1,762, net, 1,662. Hull is built of wood. Steamer carried grain last season, and is fully equipped ready to start up steam. Hull and machinery in A-1 condition. Can be inspected in Buffalo. Address Jacob Ullman, 46 Lloyd street, Buffalo, N. Y.

FREIGHT AND PASSENGER STEAMER HAZE FOR SALE. Length 147 ft., 27-ft. beam, 9-ft. draft, Condensing Engines 26 x 26, Air Pump attached, independent cut off. Marine Fire Box Boiler 9 ft. x 13 ft., fully equipped, suitable for small freight or passenger business. Can be inspected in Buffalo. Address Jacob Ullman, 46 Lloyd street, Buffalo, N. Y.

FOR SALE OR CHARTER THE TUG GEORGE PANKRATZ, now at Lorain, Ohio. Also one flat deck scow, 25 x 95 ft. long. Address Coast & Interior Contracting Co., Fayetteville, N. Y.

FOR SALE—TWO DREDGES. INQUIRE FOR PARTICULars, W. S. Carkin, 826 Ford Building, Detroit, Mich.

FOR SALE CHEAP: MAE MARTEL TUG, IN GOOD CONdition. Size, 75 ft. long, 14 ft. beam and 6 ft. depth. Engine, 14 x 14. Gross tons, 38. For further information address L. Lindauer, Little Rapids, Wis.

SCHR. "JOHN J. BARLUM" FOR SALE, BUILT BY Craig, Toledo, 1890; length 234 ft., beam 40 ft. 8 in., depth 18 ft., class A2, carries 2200 tons ore on 16 ft. Donkey boiler, two steam winches and windlass. Hull and equipment in good condition. Canadian register; can be re-registered in U. S. at small cost. In winter quarters here. Address J. E. McLurg, Soo, Ontario.

CANADIAN SCHOONER ACACIA FOR SALE AT A BARGAIN, carries 380 tons, good outfit and in excellent condition. Address People's Milling Co., Chaumont, N. Y.

STEAMYACHT CONTALUTA FOR SALE. CAN BE READILY converted into a business boat. Dimensions 75 by 13 ft. 38 gross tons. New fore and aft compound engine, 6" and 12" by 12". Wickes Boiler. Will be sold cheap. Address Chas. F. Riedinger, 1816 Ford Building, Detroit, Mich.

FOR SALE.

14-24-40 x 30 Triple Expansion Engine.
22-50 x 30 F. & A. Compound Engine.
3 Steam Windlasses. 2 Steam Steerers.
Surface Condensers—200 to 3,500 sq. ft.
Steam Driven Jet Condensers. Steam Driven Blowers.
30 K. W., 50 K. W., 75 K. W. Lighting Sets. 6 Almy Boilers.
Fire and Wrecking Pumps—Diving Gears.

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CANADIAN MACHINERY FOR SALE. ONE STEEPLE COMpound tug Engine, cheap, in good condition, price $1,000, worth $3,000. One six in. Ballast Pump $200, cost new $450. One Steamer-Steerer $300, cost new $1,100. One Fire Pump $150, cost $600. Can be seen at the Government Dock, Sault Ste. Marie, Ont. Apply to Ganley Tug Line, Sault Ste. Marie, Ont.

Miscellaneous

WE WANT TO BUY A DIPPER DREDGE. EITHER 4 YD. or 5 yd. capacity, in good second-hand condition, for service this year on N. Y. State Barge Canal Work. Quote lowest price and location of dredge. James Stewart & Co., 30 Church St., New York City.

WANTED: A PRACTICAL SHIP FITTER FOR ASSISTANT superintendent in a small ship yard in Mexico. Permanent position, excellent opportunities for advancement. Address B. T. S., care of THE MARINE REVIEW, Cleveland, O.

INVESTMENT OPPORTUNITY. ADDITIONAL CAPITAL IS needed to properly develop an established and rapidly growing gasoline engine manufacturing enterprise. Marine motors in successful use all over U. S. and in foreign countries. Plant splendidly located and well equipped with machinery and tools. No experiment, we know what we can do. Will give investors very liberal proposition, as with sufficient capital to finance an aggressive advertising campaign, success is certain and large profits sure. Address Box 6, POWER BOATING, Cleveland, O.

GINMAN BOAT CO., MUSKEGON, MICH., HAS FACILITIES for special work, and invites correspondence. Favorable prices on orders placed now. We work to your plans or ours.

WANTED TO RECEIVE DATA FROM ALL PARTIES INTERested in supplying engines driven with producer gas and equipment for generating gas for marine engines, sizes 40 to 150 H. P. Address Tampico Navigation Co., Tampico, Mexico.

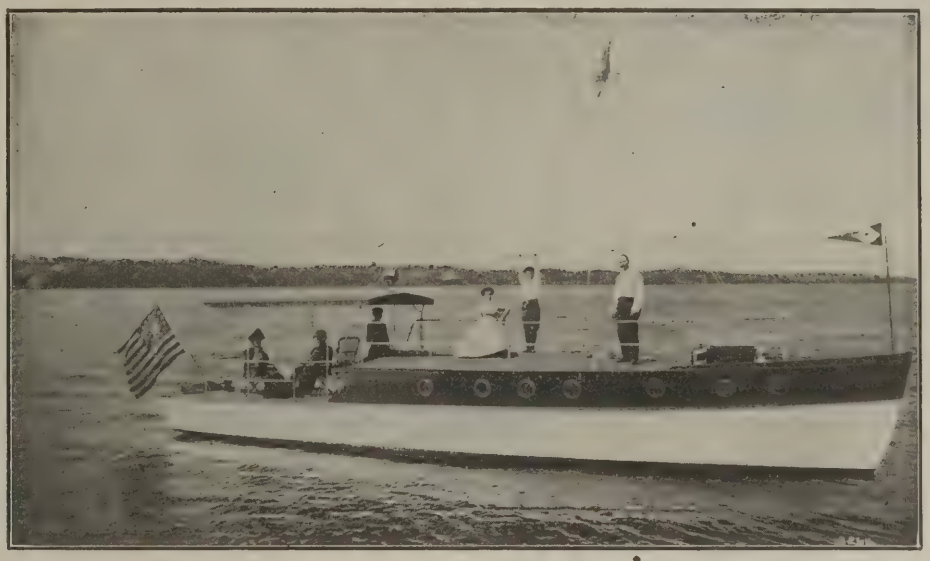
YOUR BOAT'S PICTURE PAINTED IN OIL COLORS, TRUE to life, just as she looked on that last cruise, or a rough sea, $5. A handsome picture for parlor or club. On good canvas stretcher 12 x 18 inches. This offer is genuine, and satisfaction guaranteed. We send a colored specimen of quality of work we do, for ten cents, prepaid. Boats painted from photo, sketch or description. Marine Painter, 760 Monroe St., Brooklyn, N. Y.

FOR EXCHANGE, 210 ACRES OF TIMBER LAND IN SUMter county, Fla., in one body, cheap at ten dollars an acre. Will exchange for yacht of equal value, or less and difference. W. S. Persinger, North Port, Ala.

WANTED—BOAT BUILDERS, PAINTERS, HARDWOOD FINishers, carpenters, joiners, men to install engines and pipe fittings, etc. No labor trouble. A good job for good men. Address The Matthews Boat Co., Port Clinton, Ohio.

WANTED TO CHARTER A SMALL SIZE CRUISER FOR some time in month of July, for use on Lake Erie. State size of boat. Address "X. Y. Z.," POWER BOATING, Cleveland, Ohio.

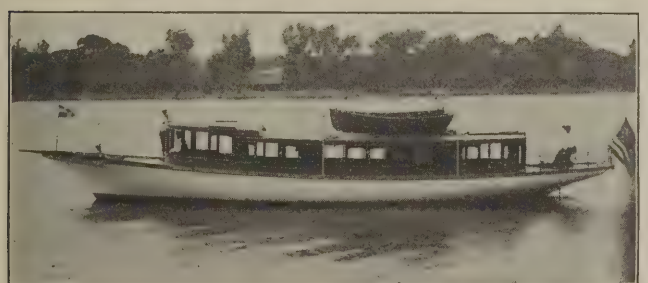
Boats for Sale



RAISED DECK CRUISER FOR SALE, 45 x 9 FT., 4 CYL., 4 CYCLE, 24 H. P. ENGINE, WHITE CEDAR PLANKING, COPPER fastened. Mahogany finished, spring berths, electric lights, fine galley and toilet. This boat is suitable for lakes, rivers and gulf. Immediate delivery. Correspondence solicited. C. F. Sparks Machine Co., Alton, Ill.

32 FT. CABIN CRUISER FOR SALE. CABIN, EXTERIOR AND interior, hatches, etc., mahogany. Sleeping accommodations for four, two wardrobes, seven large drawers, large locker space for dishes, cooking utensils, provisions, etc., buffet, ice box, sink, stove, fresh water tank and water closet. Completely furnished with cushions, curtains, carpet and linoleum. Electric lights, 25 H. P., 4 cyl., 4 cycle engine, with reverse gear. Storage battery with charging dynamo. Air compressor and whistle outfit, gasoline capacity 85 gals. Fully equipped with anchors, lines, lights, compass, tools, flags, etc. Salt water fittings. This is a new, modern and strictly first class outfit and only persons looking for such a craft reply. Price, $2,400.00. For further particulars address Lyman Boat Works, foot East Fortieth St., Cleveland, Ohio.

MOTOR BOAT "WANDA" FOR SALE, 18 FT. LONG, 3½ H. P. engine. Boat thoroughly overhauled, only been in water 3 months. Will sacrifice for $125 cash. Address Harry Townhill, 10322 Somerset Ave., Cleveland, O.



FOR SALE NO. 6152 (NEW KHAKI AWNING NOT SHOWN), 56 ft. gasolene cruiser good as new. Cruised Nantucket to Charleston. 30 H. P. 20th Century motor, speed 10 miles; 3 compartments —sleeps 6 separately, besides crew. Entire interior magnificent San Domingo mahogany, electric lighted. Must sell. Owner building larger. Condition guaranteed by Stanley M. Seaman, 220 Broadway, N. Y.

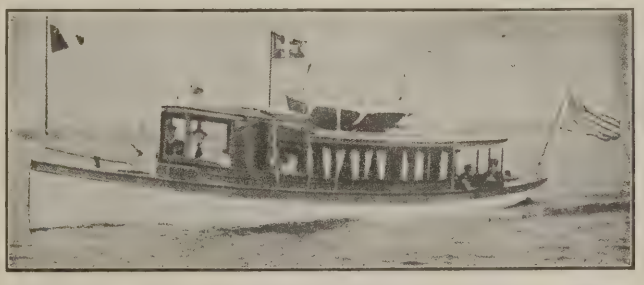
GASOLINE CRUISER FOR SALE, FINE SEA BOAT, 27 FT. o. p., 7 ft. beam, 2½ ft. draught, 8 ft. hunting cabin, 9 ft. cockpit; self-bailing, 10 H. P. Jager engine, Apple dynamo, electric fog horn and light, compressed air whistle, side lights and furnishings, complete. Address J. S. Kahler (owner), P. O. Box 165, Newport, R. I.

BROOKS MODEL 234 SEMI SPEED BOAT FOR SALE, 22 ft. x 5 ft., with top, curtains and lights, complete, with 6 H. P. Gray model S engine, Baldridge clutch, B. & B. propeller, speed 9 miles. Will sell or trade for what you have. Will demonstrate. Address C. S., 129 Maple St., Elyria, Ohio.

NEW TUG BOAT FOR SALE, LENGTH 54 FT., BEAM 12 ft., about a 45 H. P. Monarch engine, 3 cylinder 8-10; burns any oil or gas made; built in 1909. Address H. Hasselbrack, Port Clinton, Ohio.

BARGAIN: 38 x 8 x 3 TRUNK CABIN FLUSH DECK cruiser, mahogany finish, 6 berths, heavy duty Buffalo. Complete inventory, including searchlight, dynamo, storage batteries, electric lights, awning, sails, spars, anchors and cable, toilet, dishes, cooking utensils, gas stoves, large ice box, air pump on engine with tanks and whistle, 120 gal. water tank, 100 gal. gasoline storage, running and riding lights, spirit compass, 12 ft. mahogany tender, etc. In commission and in perfect condition. $1,600 cash, no less. Address C. P. Chapman, 102-104 Greenwich St., New York City.

WE HAVE THREE RAISED DECK CABIN CRUISERS, 30 and 32 ft., second hand, and a 30 ft. new mahogany finished, equipped with W. C. electric lights, power whistle, etc. Anyone in the market for this style of boat would certainly find a bargain in one of these three. Motor Boat & Supply Company, 1516-20 Columbus Rd., Cleveland, O.



HIGH GRADE GASOLINE CRUISER FOR SALE, 42 O. A., 8.6 beam, 3 draught, copper fastened, and in prime condition throughout. Solid mahogany interior. Four transoms, plush cushions, velvet carpets, lighted both electricity and oil, large toilet room and complete galley, twelve ft. cedar dinghy, full mahogany trim, searchlight, cannon and complete cruising inventory (except china, glass and table linen, which are marked with private signal). Only one owner before present. Address Henry T. Bragg, 540 Warburton Ave., Yonkers, N. Y.

LAUNCH FOR SALE, HALF STANDING ROOF, 23 x 7, NEW 8 H. P. double cylinder Barker engine, magneto, reverse gear; full inventory. Ready to run. Address W. Fred Ambler, Rowayton, Conn.

TRUSCOTT BUILT cruiser for sale, 33 x 8 x 2.5 copper fastened, salt water fittings. Has full head room, toilet, refrigerator, four cylinder, four cycle engine, dynamo, etc. Finished in raised panels, quarter sawed oak. Price, $1,800. Address F. R. Still, 17 Frederick Ave., Detroit, Mich.

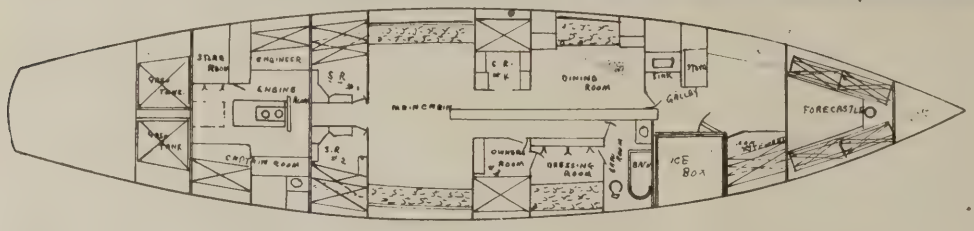
WILLIAM GARDNER, No. 1 Broadway, New York
TELEPHONE 2169 RECTOR

YACHT BROKER AND NAVAL ARCHITECT

Kindly advise your requirements. Careful inspections made of all boats before sold.

Large list of all the desirable Yachts for sale or charter, including the following:

No. 1499—OFFERED BY AN ESTATE. Handsome auxiliary schooner, recent built, in commission, 110 feet over all, 24 feet beam, 6 feet 6 inches draft; 4 staterooms, large saloon, breakfast room, bath, etc.; 60 horsepower engine of first-class make; construction and inventory of best quality. No reasonable offer refused. Inspection and trial invited.



FULL CABIN CRUISER FOR SALE, 45 x 8-8, ALL MADE IN oak. Built in 1904 by the Lamb Boat & Engine Co., 20 H. P., 4 cylinder, 4 cycle Lamb engine, ready to start. Overhauled last season. Sleeps six, roomy boat; price $1,200, about one-third of the cost. Can be seen near Cairo, Ill. Address C. H. Gray, Vienna, Ill.

FOR SALE OR TRADE, 36 FT. GLASS CABIN LAUNCH, 16 H. P., 3 cylinder engine, complete equipment, Sands closet and folding lavatory, all in first class condition, ready for commission. Best offer will take outfit. Let me hear from you. W. R. Hay, 420 Wells Ave., Menominee, Mich.

AUXILIARY SCHOONER "WEST WIND" FOR SALE, 49 x 30 x 12 x 58, built 1903, 15 H. P. Buffalo motor installed '07, very able and fast, power tender, full cruising outfit. Make an offer as boat must be sold this season. For photo and inventory address W. G. Bodamer, Buffalo, N. Y.

SPEED BOAT "EVELYN" FOR SALE, 24 FT. x 3 FT. 10 IN., white pine planking, oak frame, will seat five comfortably. Equipped with 18 H. P. Gray motor, speed 23 miles per hour, all new. Correspondence solicited. Address Adolph Feldpausch, Troy, Ind.

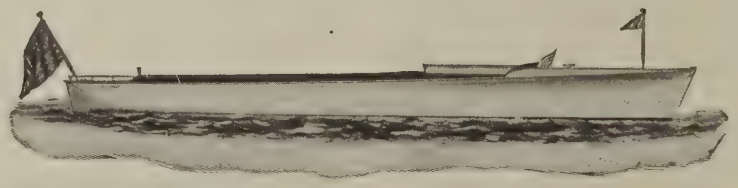
MODERN AUXILIARY YAWL FOR SALE, 38-8 O. A. x 12 ft. x 3-10, centerboard, guaranteed sound and in excellent condition. Six foot head room; sleeps nine, seats 12 at table; mahogany and quartered oak finish; two cylinder, 5 x 5 engine, good sailer. Sails in good condition. Forced to sell. Price $1,500.00. Best offer takes her. Address J. I. Maxson, Westerly, R. I.

BOAT FOR SALE, 27 FT. 6 IN. LONG, 6 FT. 4 IN. WIDE, cedar planking, oak ribs and keel, standing cabin, plate glass windows, 25 H. P. Ferro engine, bronze shaft, weedless wheel, rudder and shoe. Good condition. Speed about 14 miles. Being sold to close an estate. Price $600.00. Address Alfred T. Davidson, 76 William St., New York.

LAUNCH FOR SALE, 16 FT. x 4 FT., 4 H. P. ENGINE, seats eight people, a good reliable outfit, $100.00. Address F. E. Squires, 10630 Garfield Ave., N. E., Cleveland, O. Boat can be seen at C. D. Randle's Boat House, Rocky River, O.

35 FT. TRUNK CABIN CRUISER FOR SALE, 4 CYLINDER, 4 cycle, 16 H. P. engine, outfit new last year, speed 10 miles per hour guaranteed. Prospective buyer can have boat on trial. Will send photo on request. Price, $1,200. Fred A. Bierie, 4247 Paul St., Frankford, Phila., Pa.

High Speed Runabout "Cadoca" For Sale



Mahogany finish throughout. 50 H. P. Jager Motor installed. Speed 20 miles. Air tanks and copper gasoline tank. Condition, perfect. Sell hull with or without power. Owner buying larger boat.

THE MATTHEWS BOAT COMPANY, Port Clinton, Ohio

BARGAINS IN USED BOATS.

20 x 4 ft. 11 in. speed boat, 12 H. P., used one week.
21 4 ft. 8 in. speed boat, 8 H. P., new, $600.00, 12 H. P.
X. T. C. 21 x 4 ft. 8 in., 12 H. P., 17 miles, bright cedar hull, good as new.
Sliver, 29 ft. 6 in. by 3 ft. 9 in. hull.
25 x 6 ft. 6 in. dory, 12 H. P. and reverse.

ATLANTIC COMPANY, Amesbury, Mass.

NEW 25 x 6 CRUISER, 12 H. P., 2 CYL. HIGH GRADE engine, magneto, clutch, searchlight, etc., built best white oak and pine, interior oak, decks cork pine. Bargain, $750.00. Capt. John H. Frahm, Pointe aux Barques, L. S. S., Port Hope, Mich.

GLASS CABIN CRUISER FOR SALE, 24 x 8, 6 H. P., Mianus, sleeps four. Inventory, biggest little boat for $350.00. Canfield, 95 Wilsey Street, Newark, N. J.

WILL SACRIFICE 47 x 10 OAK AND CEDAR GLASS cabin cruiser, 18 H. P. Standard engine, speed 11 miles, like new. Address 1417 N. 55th St., Philadelphia, Pa.

YACHT "WATANNA" FOR SALE, LENGTH 56 FT., BREADTH 13 ft., Fairbanks 4 cylinder 50 H. P. engine, electric lights, closet, sideboard, ice box, compass, lights, anchors, life raft and fully equipped as a cruiser. Address Alexander Backus, 2049 Parkwood Ave., Toledo, Ohio.

FISH BOAT FOR SALE, 30 FT. OVER ALL, 10 FT. BEAM, 3 ft. draught, new last fall, 15 H. P. engine, copper tank, suitable for fishing, trap boat or freighting. Cabin aft. Address E. A. Ransom, Kingston, Mass.

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St. Lawrence River Nos. 1, 2, 3 4, 5, 6
Coast-Charts Nos. 1, 2, 3, 4, 5
Oswego Harbor
Little Sodus Bay
Great Sodus Bay
Charlotte Harbor
Lower Niagara River
Ogdensburg and Prescott Harbors

LAKE ERIE

Lake Erie (General)
Coast-Charts Nos. 1, 2, 3, 4, 5, 6, 7
Detroit River
Lake St. Clair
St. Clair River
Buffalo Harbor and Niagara River
Dunkirk Harbor
Erie Harbor and Presque Isle
Conneaut Harbor
Ashtabula Harbor
Fairport Harbor
Cleveland Harbor
Lorain Harbor
Huron Harbor
Sandusky Bay
Maumee Bay and Maumee River

LAKE HURON

Lake Huron and Georgian Bay
Coast-Chart No. 2 (Saginaw Bay)
Coast-Chart No. 3 (South End)
Straits of Mackinac
Les Cheneaux Islands
Coast-Charts Nos. 5, 6, 7, 8
Sand Beach Harbor of Refuge
Saginaw River
Tawas Harbor
Thunder Bay
Presque Isle and Middle Island
St. Marys River Nos. 2, 3
St. Joseph Channel
Cheboygan Harbor

LAKE MICHIGAN

Lake Michigan (General)
North End of Lake Michigan
Beaver Island Group
Grand and Little Traverse Bays
Coast-Charts Nos. 1, 2, 3, 4, 5, 6, 7, 8, 9
North End of Green Bay
Manistique Harbor
Charlevoix Harbor
South Fox Island Shoals
Frankfort Harbor
Manistee Harbor
Ludington Harbor
Muskegon Harbor
Harbor at Michigan City
Lake Front, Chicago
Milwaukee Harbor
Sheboygan Harbor
Manitowoc Harbor
Sturgeon Bay, Canal, and Harbor
Entrance to Green Bay
Head of Green Bay
Little Bay de Noc
Portage Lake Harbor
Racine Harbor
Waukegan Harbor
Lake Front, Chicago
St. Joseph and Benton Harbor
South Haven Harbor
Black Lake and Holland
Grand Haven Harbor

LAKE SUPERIOR

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Lake Superior No. 1 and 2
Coast Charts Nos. 1,
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Munising Harbor
Marquette and Presque Isle
Huron Bay and Huron Islands
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Portage Lake and River
Copper Harbor
Agate Harbor
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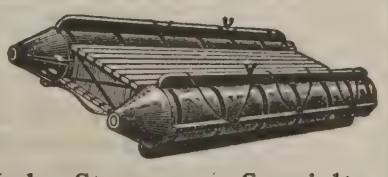

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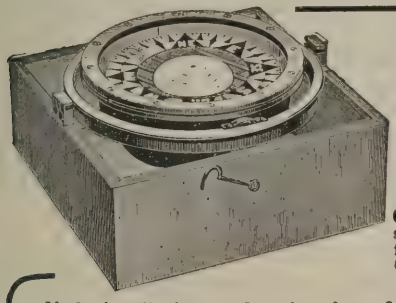

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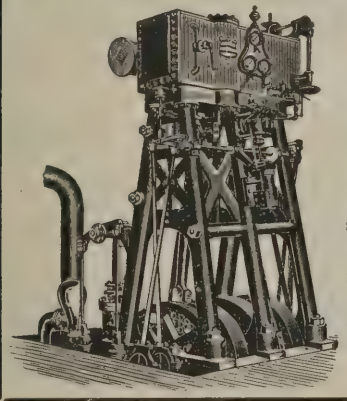

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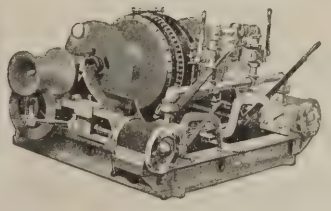

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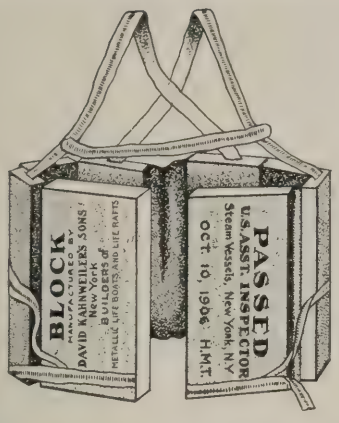

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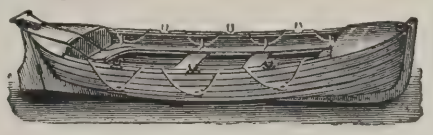

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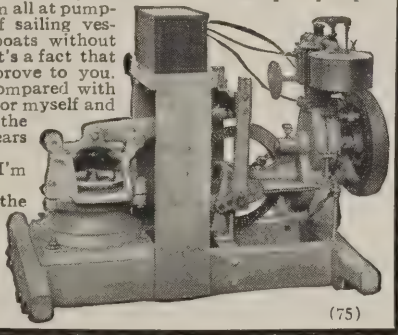

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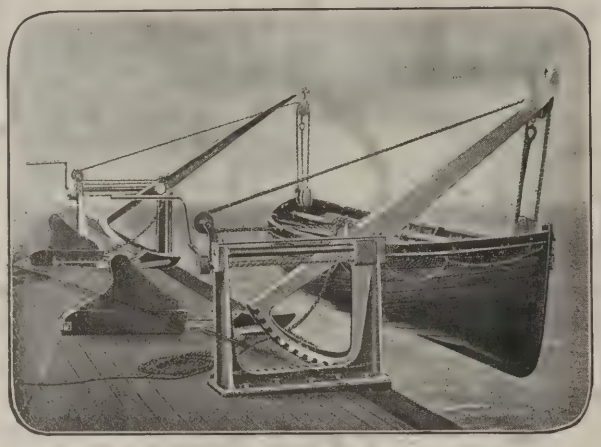

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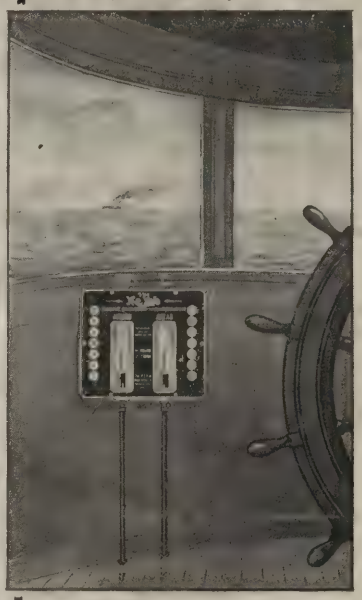

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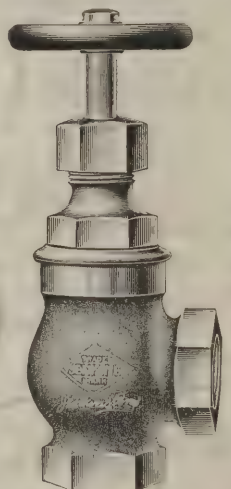

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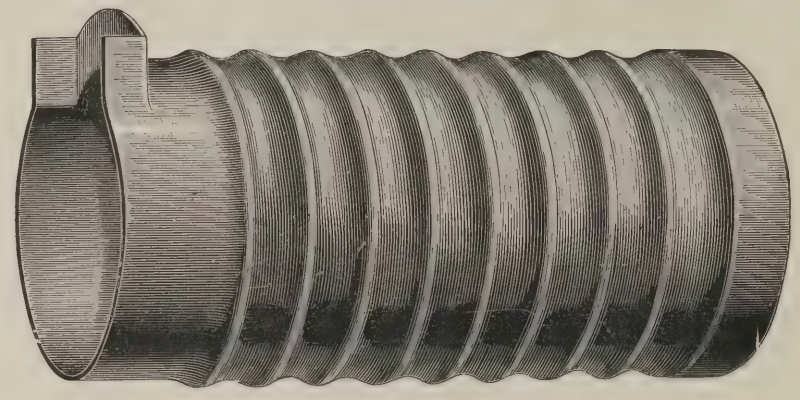

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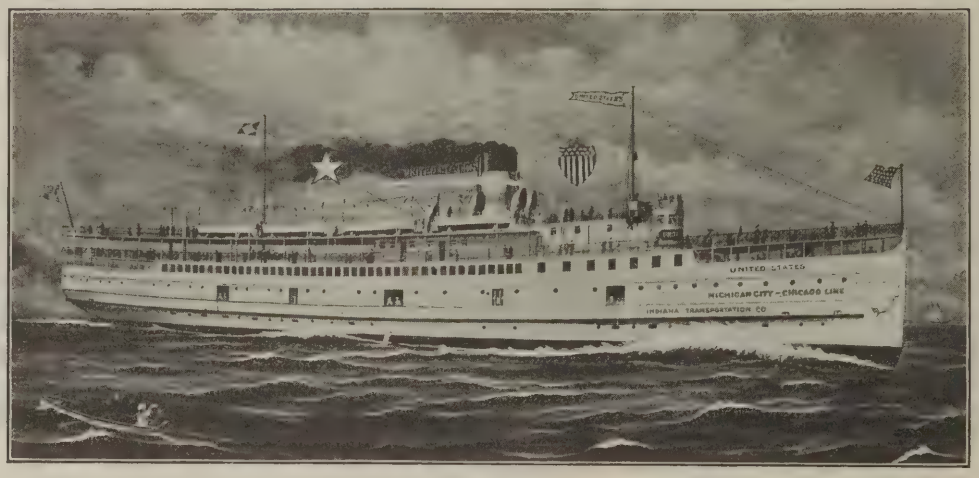

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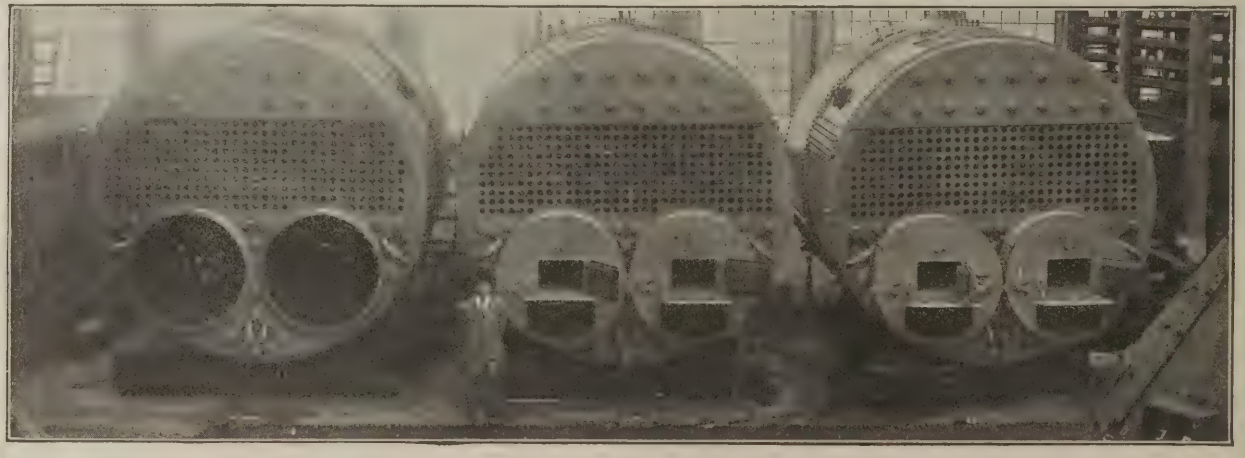

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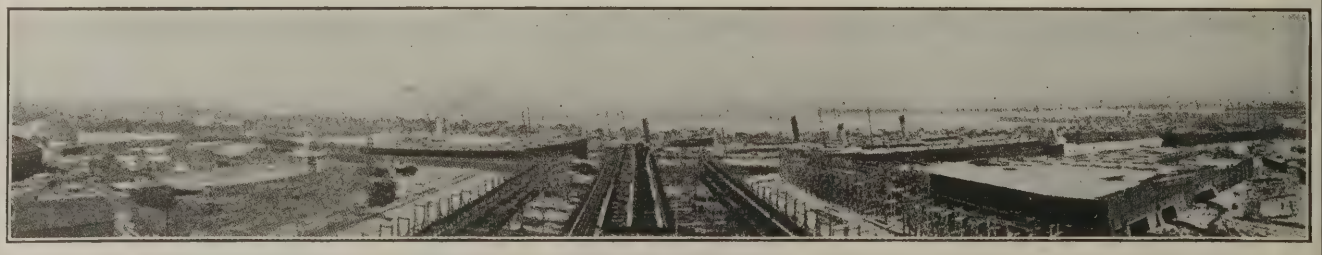

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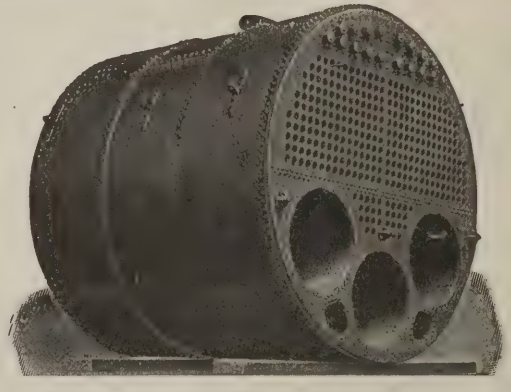

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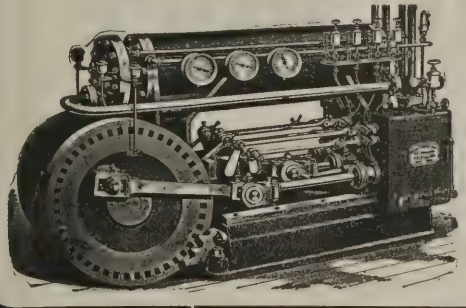

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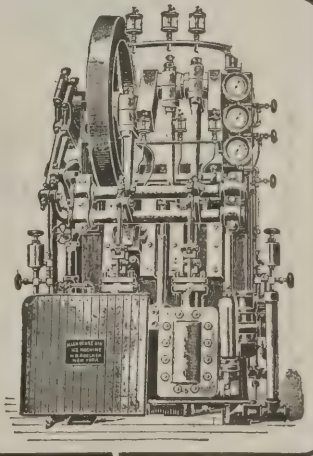

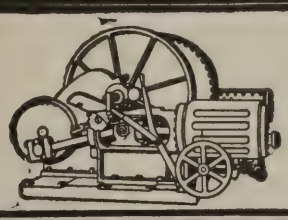

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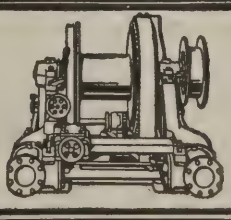

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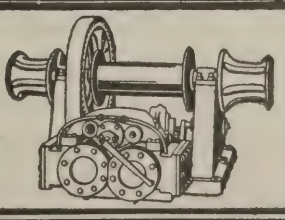

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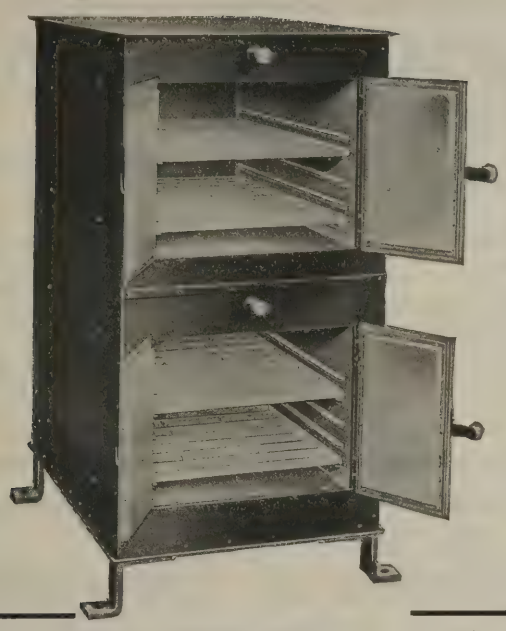

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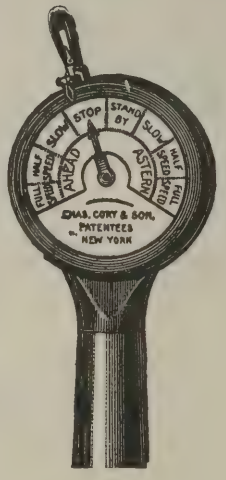

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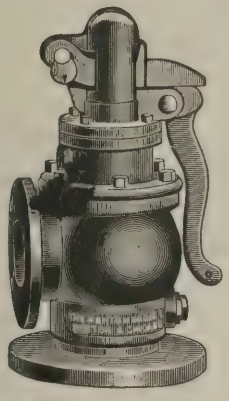

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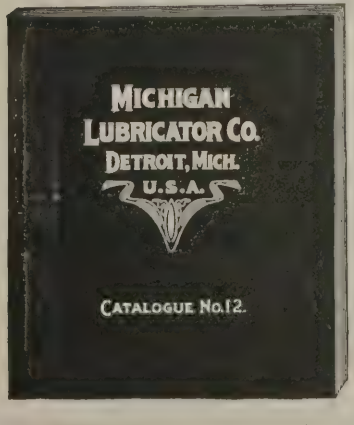

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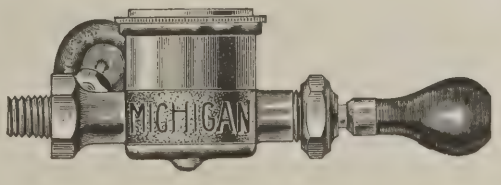

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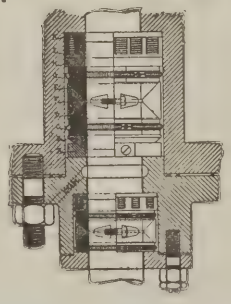

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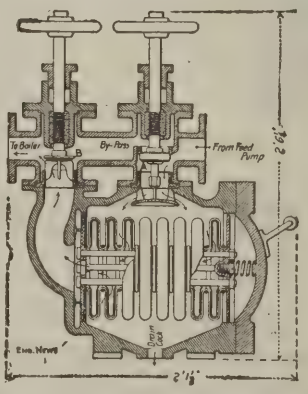

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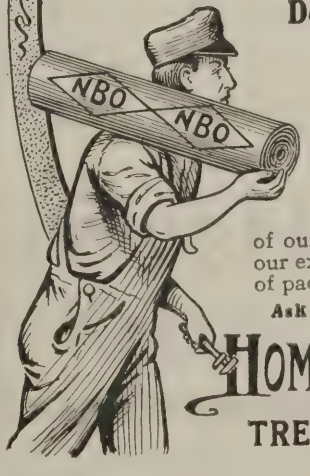

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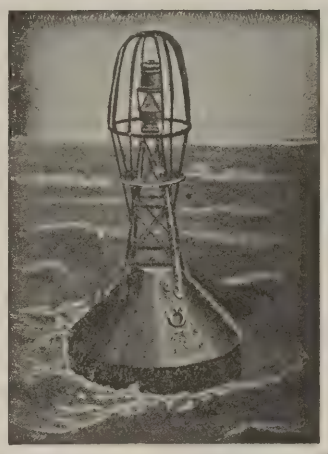

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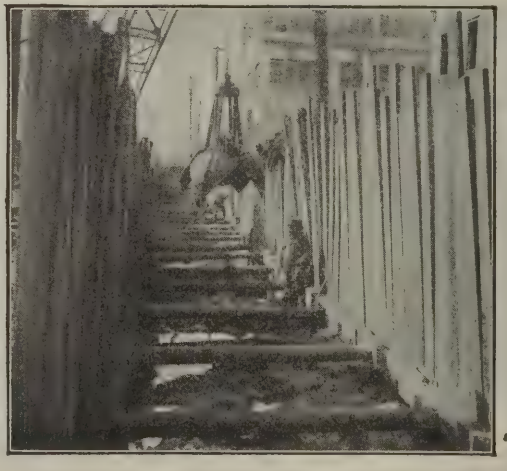

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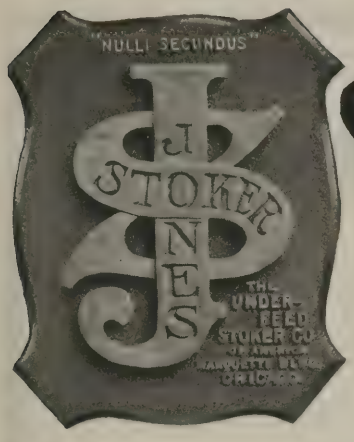

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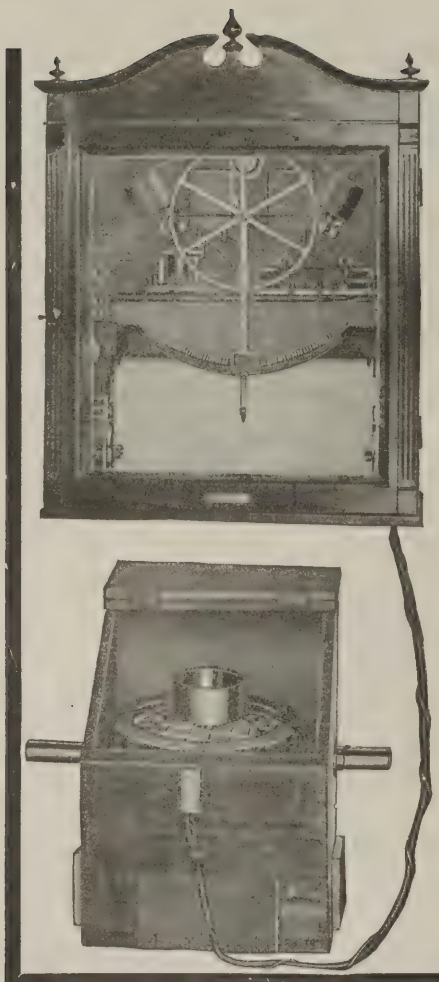

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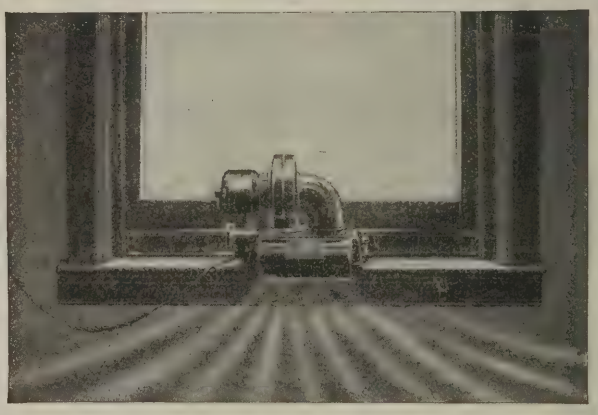

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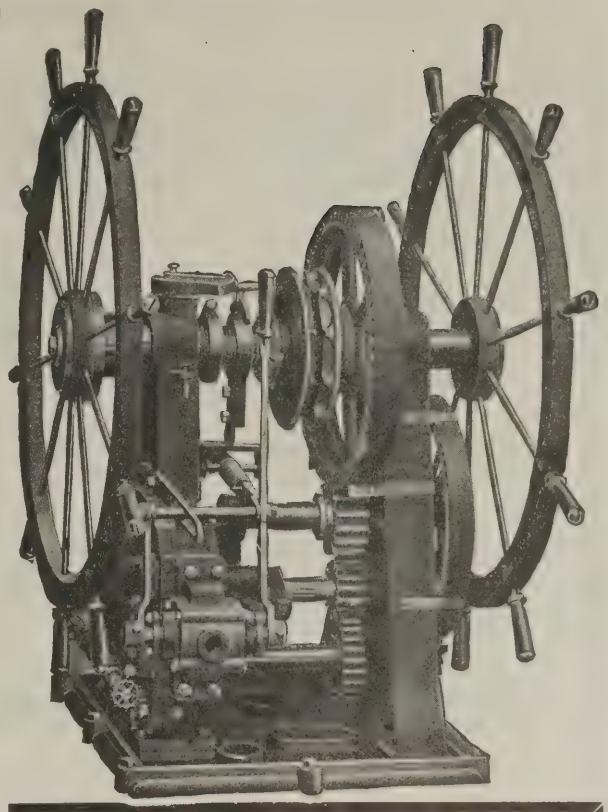

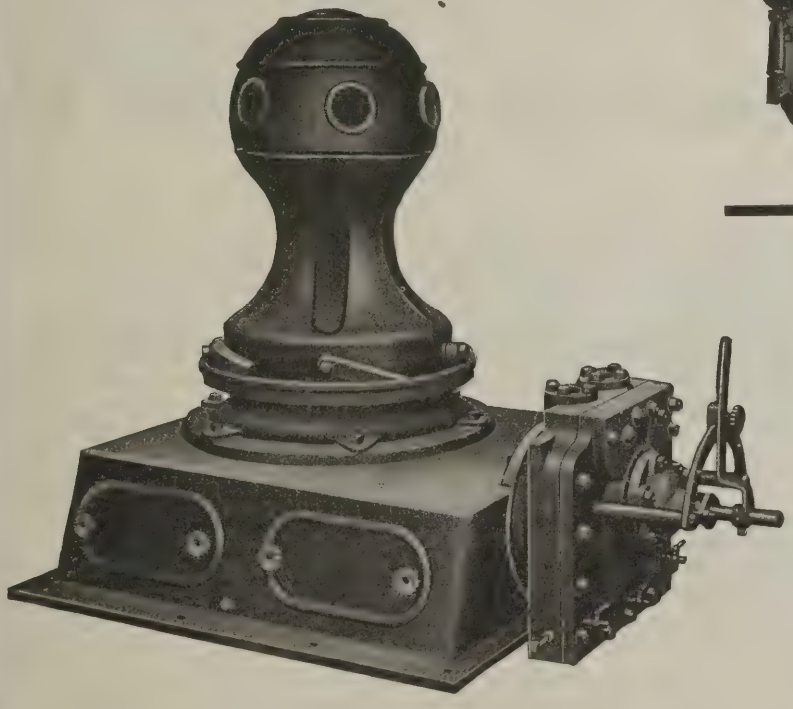

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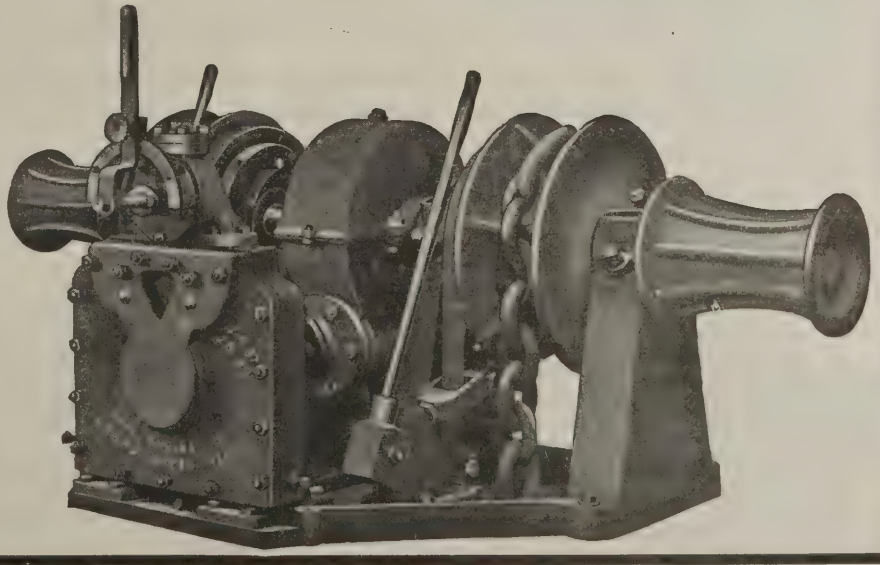

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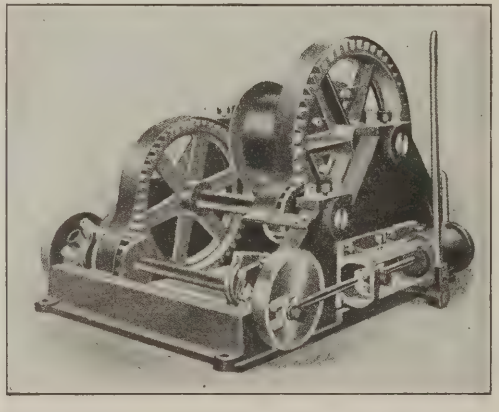

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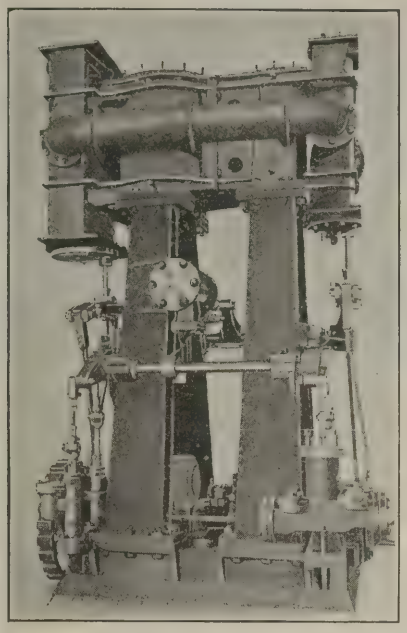

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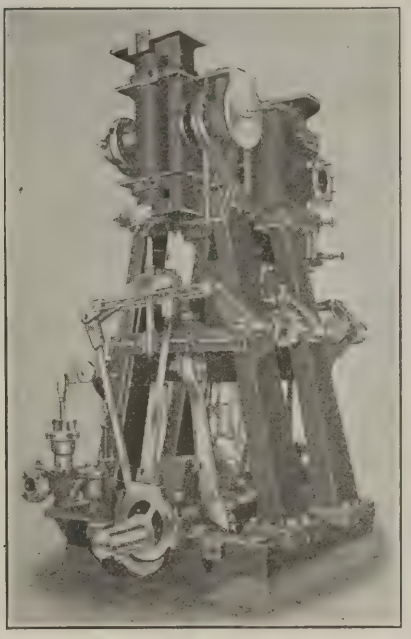

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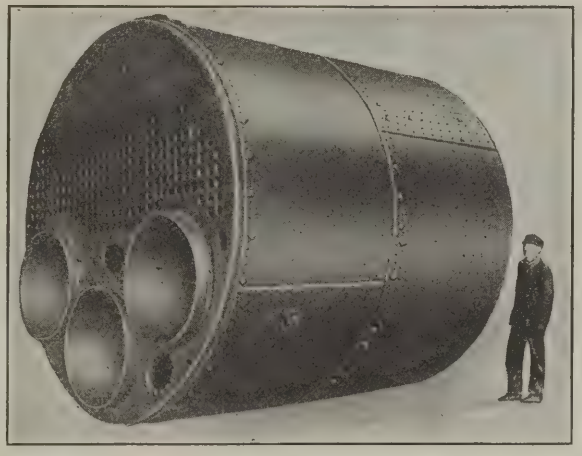

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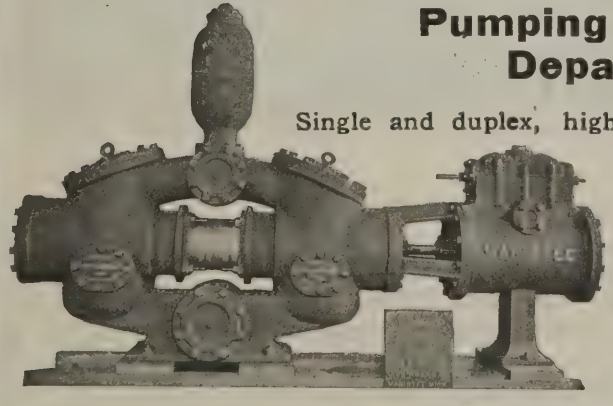

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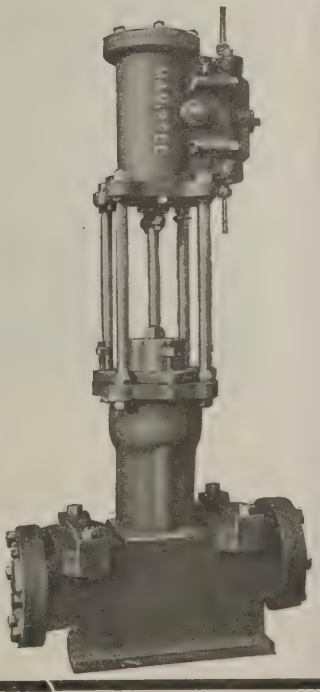

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JAN 4 1911

THE MARINE REVIEW

VOL. 40. CLEVELAND, SEPTEMBER, 1910. NEW YORK No. 9

PORT OF MANZANILLO

By M. L. Gilmore.

ALTHOUGH Mexico lies contiguous to the United States, it is less accurately known than its importance warrants. It is a land of striking contrasts and with an artistic and intellectual past, and it possesses a character and an individuality peculiarly interesting. It is comparatively easy of access and in point of picturesqueness and historical interest it has few equals.

Manzanillo Harbor, Showing Wharf and Railroad Terminal.

With a coast line of 1,600 miles on the Gulf of Mexico and the Caribbean Sea and 2,800 miles on the Pacific, Mexico has no less than 24 ports on the Gulf of Mexico and 31 on the Pacific ocean. Most of the natural harbors of Mexico are on the Pacific side, among them the splendid bay of Acapulco, considered one of the most beautiful bays of the world. The following Pacific ports are ports of entry open to foreign trade: Acapulco, Altata, Bahia de la Magdalena, Guaymas, La Paz, Mazatlan, Puerto Angel, San Blas, San Jose del Cabo, Salina Cruz, Santa Rosalia, Todos los Santos, Tonala, San Benito, and Manzanillo.

Mexico may be reached from the sea by several lines, either from New York or the Gulf ports of the United States, or via San Francisco or one of the numerous lines plying between European and Mexican ports. On the Pacific side, the Pacific Mail Steamship Co., the Pacific Coast Steamship Co., and the Kosmos Line provide means of communication, the Pacific Mail sailing regularly every ten days from San Francisco, calling at Mazatlan, San Blas, Acapulco, Salina Cruz, and Manzanillo. The Pacific Coast Steamship Co.'s vessels leave San Francisco on the seventh day of each month, calling at Ensenada, Magdalena Bay, San Juan Del Cabo, Mazatlan, Altata, La Paz, Topolomampo, Santa Rosalia, and Guaymas. The steamers of the Kosmos Line sail from San Francisco every two or three weeks and call at Mazatlan, San Blas, Acapulco, Salina Cruz, Tonala, San Benito, and Manzanillo. Several lines of steamers maintain a regular coastwise service between the different ports of Mexico, the most important of these being the Campania Naviera del Pacifico, which is subsidized by the Mexican government.

The rivers of Mexico, although numerous and some of them of considerable length, afford but scanty means of navigation, due to their small volume of water and the fact that they are apt to rise suddenly during the rainy season and fall rapidly during the dry season. The Rio Grande, the Lerma, the Rio Panuco, and the Rio de las Balsas are navigable for short distances only.

The three largest ports on the western coast of Mexico are, Guaymas, Mazatlan, Acapulco and Salina Cruz. Next in importance and destined to be one of the most extensive western ports is the port of Manzanillo, the Pacific coast port of the National Railroads of Mexico.

On Dec. 12, 1908, President Diaz

formally opened the new railroad from Guadalajara to Manzanillo. The rail communication established between Guadalajara and Colima and thence over the line already in operation to Manzanillo gave Mexico a second transcontinental railway connecting the two oceans. As a result, Colima, a small but richly resourceful section of the country, is provided with an Atlantic outlet for its products and the Pacific port of Manzanillo has become an important harbor. The export of native products, including hats, rice, and sugar, is rapidly growing and large shipments of wheat are being received from North Pacific ports. The steamship lines connecting from China and Japan with Manzanillo as a port of entry, now receive much of the merchandise that formerly was forwarded overland from Tampico.

A SECTION OF MANZANILLO, SHOWING LOCATION OF WHARF.

Manzanillo is one of the oldest and most celebrated ports of the republic. Herman Cortes built a number of ships in the port in 1525. Before it had railroad connection, Manzanillo was a port of considerable note. Through here many of the gold seekers passed to and from California in 1849 and 1850. Government roads extended from the boundary of Louisiana purchase territory to Manzanillo, offering a shorter route than by sailing vessels around the horn. Manzanillo lies almost due west of the city of Mexico, 500 miles south of Mazatlan, 900 miles north of Salina Cruz, and 400 miles north of Acapulco. It stands at the extreme western point of the long narrow ridge of land that separates the ocean from the Laguna de Cuyutlan. This lagoon is 9.3 miles long by 8.82 miles wide, and is filled with green brackish salt water which is very shallow at all times and during certain seasons of little rainfall dries up entirely.

When the port works which have been under construction since 1899 are finished, it will be one of the best equipped and most desirable ports on the coast. The Mexican government has spent over 8,000,000 pesos within the last few years improving the harbor facilities, getting it ready for the commerce that is coming to it following the opening of the railroads. Manzanillo bay opens out directly on the Pacific ocean and the long open stretches of water comprising Santiago and Manzanillo bays offer little or no protection from the northwesterly winds and ocean swells. To provide secure and protected anchorage, the government began, in 1900, the construction of an unusually massive breakwater from the outer point north and east curving toward the sand bars surrounding San Pedrito lagoon. This breakwater contains about 1,500,000 tons of blue granite from the Colima quarries and is one of the largest in the world, rivaling in size those of Cherbourg, France, and Plymouth, England. It is 1,446 ft. long, 600 ft. of which stands in water 60 ft. deep. This wall has a width of 300 ft. at the bottom and is topped by a cement crown, 25 ft. wide and 16 ft. thick. The body of the work is built of granite blocks, some of which weigh 50 to 60 tons. On the seaboard side, it is protected by blocks weighing 30 tons and on the inner side by smaller ones ranging from 3 to 15 tons in weight. Further extension of the breakwater will, when finished, provide a protected harbor area of 165 acres with a uniform depth of about 39 ft., enabling it to accommodate sea-going vessels of deep draught.

The port work development involves the dredging of the harbor immediately below the town, where a bottom of coral reefs and sand extends entirely around the bay. This originally provided very poor anchorage except in deep water. On a line from Point San Pedrito to Point Chiquita del Viejo, a depth of six fathoms prevails and the depth increases rapidly outside of this. Outside of the coral reefs extending around the bay along the sand shores, there is a depth of five to six fathoms. Seawalls built at the edge have been backed up by the material removed by dredging, giving interior seawalls aggregating 2,600 ft. in length. The dredging work is being done by Col. Smoot. Due to the nature of the soil, dipper dredges and grab buckets are used to bring up the material. Then it is dumped into a trough and water pumped through to carry it ashore to fill in back of the walls. Tides vary from 2 to 4 ft., the greatest difference being 5 ft. Currents come from alongshore for the most part and average one-half to one and one-half knots per hour.

HOTEL MANZANILLO, A TYPICAL BUILDING IN MANZANILLO.

Although the government is doing the

harbor improvement work, the National Railroads of Mexico own the terminals and wharves. The docks are built at right angles to the shore line and are one-story sheds, built of corrugated iron on a wooden wharf. The railroad terminals are directly above with the switching yards, terminals and stations arranged in parallels. Ships are piloted in from the breakwater by a harbor pilot, but come in under their own power and are anchored head out at the wharves.

A great difference is noticeable by an American in the methods employed in handling cargoes from the ships in unloading. A large amount of wheat is shipped to Manzanillo from north Pacific coast points. Wheat is brought out of the holds in slings by the ships' winches and transferred to a raised platform, the top of which is about as high as a peon's shoulder. Wheat in sacks is for the most part carried on peons' shoulders directly into the cars. Peons comprise most of the native labor. They get "$1.00 Mex." per day, which is 50 cents in gold, for day shifts, and "$1.50 Mex." or 75 cents in gold for night shifts. Native labor is so cheap that it is more economical to handle freight in this way than by any system of mechanical conveyors.

This little port, with 1,500 inhabitants and no dry docks or repair facilities at the present time, is destined through its location to become one of the large seaports of the west Mexican coast. The mineral wealth of Mexico in silver, gold, copper and lead is proverbial. Extensive forests abound in hard woods, dye woods and medicinal plants. Coffee, tobacco, cocoa and sugar are beginning to be exported in large quantities. Back of these raw materials and opportunities is the corporation, known as the "National Railways of Mexico," which is a consolidation of the Mexican Central and Mexican National Railways, capitalized at $230,000,000. The Mexican government holds $115,002,290 worth of shares, which is a majority of the capital stock and makes the government the deciding factor for development.

Port Dues for Manzanillo, Mexico.

Pilotage—$9.00 Mexican ($4.50 gold).

Dockage, outside harbor, nothing.

Port dues—1½ cents per ton Mexican (¾ cent gold).

Gross for all Mexican ports, payable at first Mexican port, where vessel calls. No other dues for other subsequent ports of call.

Hospital dues—½ cent per ton gross, Mexican (¼ cent gold), at each Mexican port of call.

American bill of health—$2.50 gold.

Water—1 cent per gallon Mexican (½ cent gold).

Ordinary ship supplies are obtainable. Water is all brought from mountains, 40 miles inland.

Mexican laborers on board ship have the following schedule:

Day:—

6 a. m. to 11 a. m.

1 p. m. to 5:30 p. m.

$1.00 per shift Mexican (50 cents gold).

Night:—

7 p. m. to 12 p. m.

1 a. m. to 5:30 a. m.

$1.50 per shift Mexican (75 cents gold).

Ordinary labor, $20 to $25 per month Mexican ($10.00 to $12.50 gold).

An Atlantic Motor Liner

AN arrangement has been entered into between the Hamburg-American Steamship Co. and the Standard Oil Co., for an adequate supply of liquid fuel in consequence of the fact that the Hamburg-American Co. has decided to build a 9,000-ton Atlantic liner, which will be driven by motor. The order for this new type of cargo vessel has been given to Messrs. Blohm & Voss, Hamburg.

The enormous saving of space both below and on deck, will be of material moment to a freight carrier of the type it has been decided to build. The two great motors to be employed in propelling the ship are of the Drexel type each with three cylinders, which at 120 to 150 r. p. m. are to develop some 1,500 h. p. each, and one immediate advantage is the economy amounting to 75 per cent, which will be effected in engine room space, thus giving so much the more cargo accommodation. Another economy is the smallness of the engine room staff, only three engineers and three oilers being required for both motors in watches of eight hours each. For fuel, petroleum residue will be employed. In Germany, it can be bought for $2 per ton, and in America—one of the terminals of the voyage—it is considerably cheaper. The whole cost is considered to be about 75 per cent less than coal. The vessel's screws are somewhat smaller than those usually allotted to craft of 9,000 tons, making up to 150 r. p. m., but it is expected that a speed of about 12½ knots will be obtained. Whilst ordinary steamers can only convert about 16 per cent of fuel consumed into energy, a motor-driven vessel converts 30 per cent. The new steamer, which will be completed in 12 or 14 months, is intended for the Hamburg and New York and Philadelphia trade.

The engines will be rather similar in appearance to the ordinary vertical steam engines. The gear is most simple, the valves being operated by a few very short levers. Every valve can be changed in a couple of minutes, and all parts are as easily accessible as can be desired.

The simplicity of the reversing gear can never be matched by a steam engine. Regulation of revolutions and reversing will be done by a small hand wheel. The propeller, of course, is coupled directly with the engine thus ensuring easy handling, the same as with steam engines. For lubrication the circular system of stationary engines has been adopted. The stresses of the different parts of the machinery are kept within very low limits, and are subject to the control of the British and German Lloyd. The consumption of fuel will come to some 200 grams per h. p. per hour. The engine room of the vessel will present quite a novel aspect, the more so as the auxiliary engines will also show the latest improvements of technical progress. The absence of funnels will even externally point out the novelty of this new type of vessel, which is to be built entirely, hull and engines, by the Germans.

The enormous impetus that it is expected will be given to the development of oil fuel as a motive power for large steamers will have far reaching results in the near future. The experiment will undoubtedly be watched with the keenest interest the world over.

A Notable Non-Stop Run

The steamship Waimate has recently completed a remarkable run between the Clyde and Vancouver, B. C., via Cape Horn. The vessel, which is owned by the Union Co., of New Zealand, steamed the whole 15,000 miles without ever stopping her engines, completing the voyage in 62 days at an average speed of 11½ knots. This is believed to be a world's record. Several instances are on record of American ships, covering the voyage between Atlantic coast ports and the Pacific coast without stopping engines, but the distance between Great Britain and the Pacific coast is, of course, much greater. There are a number of instances also of ships having made the run between Britain and Australia and New Zealand via the Cape of Good Hope without stopping, but this also is a shorter course than that covered by the Waimate.

IMPROVEMENTS IN LIQUID FUEL APPARATUS

Oil Fuel Making Headway in the Navy and Mercantile Marine

BRITISH marine interests have awakened to the advantages of oil fuel. What has, in large measure, contributed to this change is, in the first place, the success that has attended the British admiralty experiments with the Kermode burner which has been previously described in THE MARINE REVIEW, and also the recent developments in oil which give promise that before long a world-wide area of supply of fuel oil will be available. The investigations as to the best methods of using oil fuel have also brought to light many points in its favor. While the practical use of oil fuel in ships of war has justified the admiralty in equipping the latest battleships, cruisers and destroyers for its use and in ordering a supply of 32,000,000 gallons of the fuel, it is interesting to note that the British naval authorities have been influenced in their present attitude towards oil fuel in addition to the favorable investigations carried out by the Unted States navy, by the successful experiments made on board the British destroyer Surly with the Kermode burner.

The advantages of oil over coal as a fuel on board ship have been demonstrated in the facility with which the bunkers can be filled and the furnaces automatically fed, the saving of space, the quickness and ease with which steam can be raised and maintained, and the higher average speed obtainable in consequence, the smokeless combustion, even at high speeds, and in the cleanliness and comparative cheapness of oil fuel, considering the advantages gained. All these points are of vital importance in the matter of naval efficiency, as the admiralty authorities now fully realize. All the newer battleships and cruisers, including the Dreadnought class, have been fitted for burning oil as well as coal, and many older vessels, originally designed to use coal only, and which would to that extent have been obsolete, have also been fitted with oil fuel apparatus at small cost. For cruising in time of peace coal is used, but in maneuvering, or when on a war footing, the oil burners are turned on. The use of oil fuel reduces the displacement of a ship compared with that of a coal-fired ship of the same power. A man-of-war equipped with oil-fuel becomes more mobile than one dependent solely on coal. The exhaustion of stokers, the burning down and cleaning of fires necessitated by the use of coal, the depositing of soot in the boiler tubes, representing loss of power, all are obviated by liquid fuel, and, moreover, fewer stokers are needed. Oil fuel, therefore, is a necessity in the battle line.

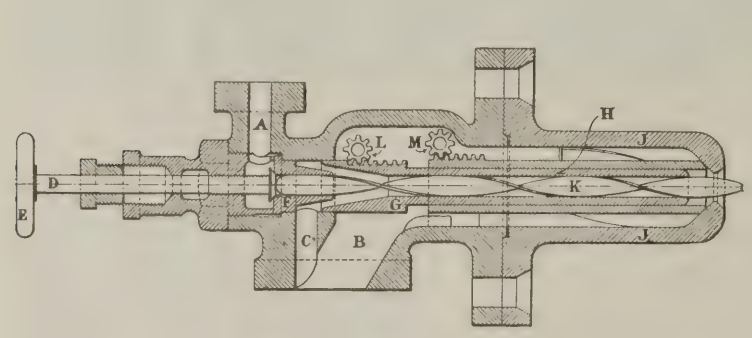


FIG. 1—AIR JET BURNER.

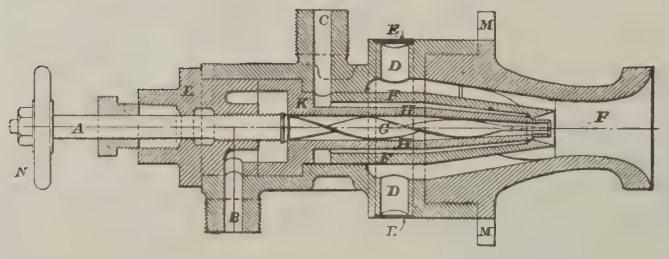


FIG. 2—STEAM AND AIR JET BURNER.

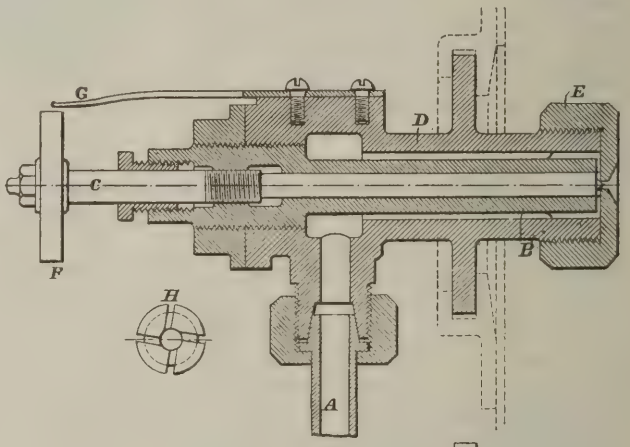


FIG. 3—PRESSURE JET BURNER

Ocean Liners and Oil Fuel.

At present a number of mail and cargo vessels on the Pacific coast of North and South America and between California and Japan, and most of the trading steamers in the Dutch East Indies use oil fuel, as well as the ships of the Anglo-American Oil Co., carrying oil to Europe. Some remarkable steaming feats have been achieved by oil-driven vessels. For instance, the boats owned by the Shell Transport Co. have for years voyaged

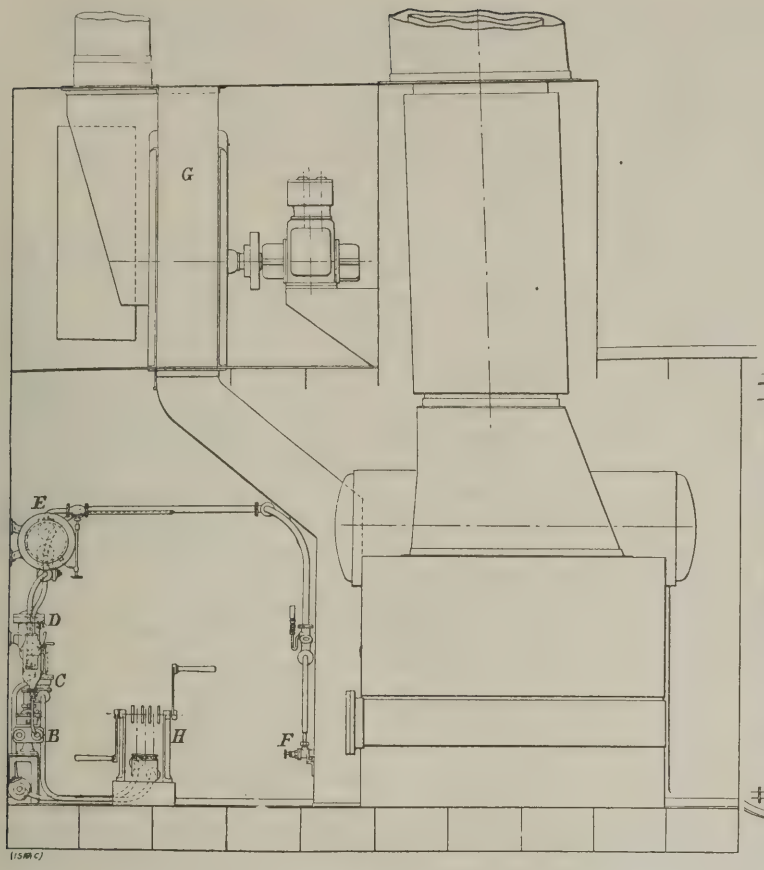


FIG. 4.

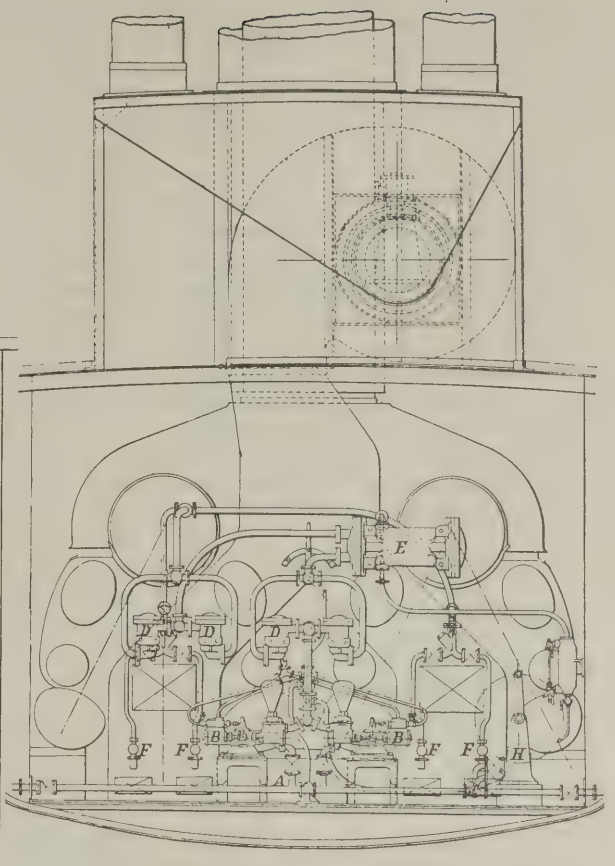


FIG. 5.

direct from Singapore to London, via the Cape, a distance of nearly 12,000 miles, without rebunkering, which would be impossible with coal. The North German Lloyd steamer Tanglin was fitted for both fuels, and on a trip to Sydney, used an average of 13 tons of oil per day as against 20 tons of coal. The relative prices at Singapore were $7.20 per ton for oil, and $6 for coal; the daily expenditure, therefore amounted to $93.60 for oil, and $120 for coal, besides maintaining an average speed with oil of 11½ knots, an increase of one knot per hour compared with coal, while only one man per watch was required in the stokehold instead of five with coal. About 350 tons of oil were bunkered at Singapore in 45 minutes. The extra freight that might be earned can be formed by multiplying the deadweight difference between oil and coal for daily consumption, by the days on voyage, So far none of the great Atlantic lines have adopted liquid fuel although the latest liners have been so constructed that they can be readily adapted to the use of oil. On the Mauretania and Lusitania for example, 5,500 tons of coal are consumed between Liverpool and New York, or 11,000 tons for the round trip for a speed of 25 knots. Six hundred tons of oil would accomplish as much as the 1,000 tons of coal now used every 24 hours, about 2,000 less fuel on a five days run, or 4,000 tons on the round trip. Of the 312 firemen and coal passers now employed on each ship, 285 might be dispensed with, and 27 oilers would be able to attend to both the oil burners and feed water. About 200 third-class passengers at $25 each could be berthed by altering the accommodation reserved for the 285 firemen and trimmers. It is estimated that even with coal at $4.40 per ton, as against oil at $9 per ton on the eastward voyage, and $16.25 westward, the increased earning capacity with oil fuel would be about $19,400 from New York to Liverpool, and $9,400 from Liverpool to New York. A full supply of oil could be put aboard in three hours, compared with 20 hours for coal. Moreover cleaning fires and irregular coal stoking is responsible in some cases for 10 per cent loss of steam thoroughout a voyage, while experience on other ships justifies the belief that the use of oil fuel would reduce the voyage between Queenstown and New York by eight or ten hours.

New Type of Burner.

A new type of the Kermode liquid fuel plant has been designed in which the burners are of the air-jet type, and can be used with low pressure superheated steam, in case the supply of compressed air should fail. One of them is shown in longitudinal section in Fig. 1, from which the action will be understood. The oil enters at the branch *A* after which its flow is regulated by the conical valve on the spindle *D*. After being heated by its passage through a suitable apparatus placed in the hot gases, from the boiler, the air enters the branches *B* and *C*, the portion entering through *C* meets the oil as it passes the conical control-valve, which is operated by the wheel *E*, and the oil and air travel on together, the former being rapidly vaporized in its passage. In order to assist this process there is a helix *K* placed in the central tube which effects a complete admixture of the air and vapor. The supply of air can be regulated at two points by means of the pinions and racks shown. One of these pinions, marked *L*, moves the internal tube over the oil-delivering nozzle *F*, and so regulates the air which enters there. The second pinion *M* operates the other tube and varies the amount of air escaping round the mixed jet at the end

of the helix *K*. By this arrangement the combustion of the oil is under complete control, and the vaporization is very complete. At the point where combustion is about to commence a further supply of compressed air is given, and a third supply is added by the draught which comes through the fire-bars, and in special cases through a hollow furnace-front, and passes between the inner and the outer plates, and escapes through a coned opening round the burner.

When the air-compressor is under repair or examination, the oil-fuel burners can be operated by means of low-pressure steam, which is superheated on its way to the burners by means of a suitable heating apparatus.

Turbo-Air Compressor.

On board ship the use of a turbo air-compressor is advantageous, as it makes for lightness and neatness. A further advantage of this system lies in the fact that no alteration of the boilers, as arranged for coal-firing, is needed, and the change fom liquid fuel to solid fuel, or vice versa, can be made instantly, and without loss of steam pressure. It is claimed that the air-compressor absorbs less than 2 per cent of the steam raised, and this steam is condensed and returned to the boilers as hot feed.

The steam jet burner is shown in longitudinal section in Fig. 2. The oil enters the burner through the branch *B*, and has a whirling motion given to it by the prolonged spiral stem of the valve spindle *G*, the amount of oil being governed by the hand-wheel *N* at the end of the spindle *A*. The steam enters at *C* around the hollow cone *H* and passes through slots (not shown) in the cylindrical portion of this cone, where it fits the inside of the hollow air-cone *F*. It will be seen that in this way all the oil passing through the burner is steam-jacketed. The air-cone *F* is also fitted with spiral guides, and the air is drawn past these guides through the openings *D* by the inductive action of the steam. The amount of air passing may be regulated by means of the movable perforated strap *E*. On the front portion of the burner is the part marked *F*, which is so arranged that it can be screwed in or out as a whole, being turned by the spider *M*. When moved, it carries with it the cone *F*, and in so doing regulates the space between this and the oil-cone *H* for the escape of the steam. As the range of adjustment is large, the same burner may be used for different powers within wide limits. When the burner is started, the steam opening is first adjusted by trial, which is done by unscrewing the front of the burner, so that the space between the cone *H* and that marked *F* allows the minimum amount of steam required for atomization to pass through. The amount of opening for induced air is readily determined by the character of the flame and the sound of the fire when in operation. The flame should be transparent and of an intense white color or approaching pink when using light oils. The steam-jet burner may be operated by means of steam or air, and in the case of this burner, as well as that of the air-jet burner, no alteration of the furnace, as arranged for coal, is necessary. When oil is to be the only fuel used, however, there is no object in fitting fire-bars, and a suitable arrangement of brickwork is provided. It is claimed that the steam-jet system just described will recover from 68 to 74 per cent of the calorific value of the fuel used in actual work.

Pressure Jet Burner.

The latest type of Kermode burner brought out is the pressure-jet burner which has been specially designed for naval and other vessels, and it is recommended for use with forced or induced draught. The burner is shown in longitudinal section and in plan respectively in Fig. 3. The oil fuel enters the burner through the channel marked *A* in Fig. 3 and passes between the outer wall of the burner marked *D*, and the inner cylinder marked *B*, which abuts against the cap-nut *E*. The end of the cylinder *B* is an exact fit in the outer casing *D* where it abuts against the nut *E*, and in this end of *B* a number of grooves are cut parallel to the center line of the burner, while there are similar grooves in the end of the part *B* at right angles to the axis of the burner. These grooves are shown at *H* in Fig. 3, and it will be seen that they are tangential to the cone end of the spindle *C*, which serves to contract, or enlarge, the opening through the cap-nut *E*. The movement of *C* is indicated on the graduated wheel *F*.

By means of this arrangement the oil fuel is atomized very completely, by being forced through a restricted opening with a rotary motion, which is given to it by the tangential grooves in the face of the plug *B*, and it is distributed in the form of a cone by means of the reaction or deflection which is set up by the oil impinging on the cone end of the spindle *C*. The fixed pointer marked *G* serves to indicate the degree to which the wheel *F* has been rotated, either to increase or diminish the opening through the nut *E*. With this burner neither steam nor air is required to disintegrate the oil, the pulverization being effected by means of the pressure which is brought to bear upon the oil fuel itself by means of a force-pump. Before use, the oil is heated and carefully filtered.

A complete outfit of this pressure jet system has just been supplied to a steamer which is being built in Java, the installation being shown in Figs. 4 and 5. There are two Yarrow type water-tube boilers, each with a heating surface of 750 sq. ft. Forced draft is used, as may be noted, on the closed ashpit system, and each of the boilers can be worked separately so that the full power can be obtained from one boiler should circumstances demand. The arrangement of the installation is clearly shown in Figs. 4 and 5. The oil-fuel suction-pipes may be seen at *A*, Fig. 5, and the oil force-pumps at *B*, Fig. 4. *C* is a spring-loaded relief-valve with a return branch to the suction side of the force-pumps. The oil-fuel filters fitted in duplicate are shown at *D*, the oil-fuel heater at *E*, the burners at *F*, and the fan for supplying the forced draft at *G*. The fires are started initially by means of the hand-pump *H*.

The steam which is used for driving the oil force-pumps and for heating the fuel is condensed and returned to the feed-tank, so that no water is lost, as with the steam-jet system. It is claimed that with the pressure-jet system the saving of feed-water, the lightness of the equipment, and its immunity from breakdown through the duplication of force-pumps and filters are considerations which have decided its adoption for use on warships. This system is said to recover from 70 to 75 per cent of the calorific value of the fuel used in actual work.

Contract for Harbor Tugs

The Department of Docks and Ferries, of the City of Philadelphia, has awarded to the Waters-Colver Co., of West New Brighton, S. I., the contract for building two new tugs for use in Philadelphia harbor. One tug will be 81 ft. long, 20 ft. wide and 9 ft. depth of hold. The propelling machinery consists of a fore and aft compound engine with cylinders 12 in. and 26 in. by stroke of 18 in. The other tug will be 66 ft. long, 16 ft. wide and 17 ft. depth of hold, with propelling machinery consisting of a single high-pressure engine 14 in. by 14 in.

Contract for the enlargement of the naval dry dock at Norfolk, Va., has been awarded to William L. Miller, of Boston, for $523,784.

MOTOR BARGES OF THE CHESAPEAKE BAY

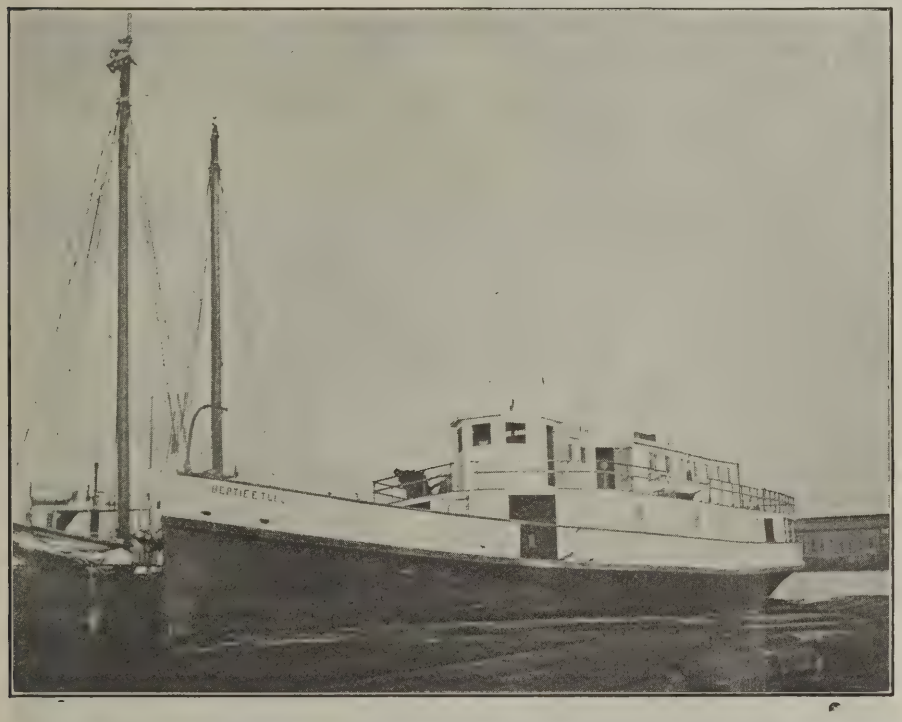
By Stuart Stevens Scott.

ON no body of water in this country has the woorking motor boat reached as high a development as on the Chesapeake Bay, that great inland sea that, with its numerous tributaries, penetrates deeply into the states of navigable water for light draught vessels.

Ever since the states of Maryland and Virginia have been settled the maritime interests have been large, especially those interests of the bay and great numbers of sailing craft that ply between Baltimore at the head of the bay and Norfolk at the foot, and the hundreds of steamers that run from the two cities named along routes leading up the various rivers and to the hundreds of wharves along their banks, made but small inroads upon the sailing craft that hauled lumber, cordwood, farm products and general merchandise.

During the past decade, however, there has been wrought an enormous change, a change so great that only those familiar with the conditions can appreciate it, and it has been brought about by the perfection of the internal combustion engine, a power so cheap and effective that it has not only almost entirely killed the industry of building sailing craft, but it has entered closely in competition with the river steamers, besides opening up entirely new sections of the tidewater counties to direct communication with the cities of Baltimore and Norfolk.

It is estimated that there are not less than 3,000 working boats of all classes on the Chesapeake carrying on commerce in all of its phases. From Baltimore alone there hails 84 documented power craft, most of which are working boats and their aggregate tonnage is 2,035 tons, gross. Of these, eighteen are of more than 15 tons each and they are engaged in freight and passenger work. Three of them haul passengers exclusively.



Bertie E. Tull, Largest Gasoline Boat on Chesapeake Bay.

These eighteen craft represent the largest gasoline boats on the bay and their combined tonnage is 1,079 tons, or more than one-half of the tonnage of the entire fleet of documented craft. To cite the tonnage of the boats that hail from Baltimore, however, is not altogether fair, for the majority of the power craft hail from many of the small tidewater towns—Annapolis, Crisfield, Cambridge, Oxford, Tappahannock, Cape Charles City, Hampton, Newport News and Portsmouth—where they are built or the closest town where their interests lie. For example, there is a shipyard at Madison, Md., that has turned out some excellent examples of the gasoline barge, some of which are of nearly 40 tons.

While the gasoline barge has been of vast benefit to general merchandising its greatest value has been to the farmers, whose lands are washed by creeks of a few feet depth. Many of these estuaries could not be navigated by a sailing vessel because of narrow channels. Likewise is the lack of water prohibitive to a steamer. With the gasoline barge, however, the streams afford ideal conditions. No longer does the farmer have to haul his produce to the nearest wharf, let it lie there until the steamer comes and perchance to perish in the interim. He either buys or builds a motor boat, or makes a deal with some of his neighbors, erects his own wharf on his own property, loads when it suits him and gets his vegetables and fruit to the market in time to command the maximum prices.

Scores of farmers in the tidewater counties own and operate their own motor boats, while there are several companies that operate motor barges on regular schedules, just as the steamers are, and they have all made money. Indeed, some of the general store keepers in the lower part of Maryland have found it advantageous to patronize these motor boat lines, getting their merchandise not only quicker by that means, but even cheaper freight, which counts considerable.

There are few states that have such a large number of men employed in making a livelihood from the water as in Maryland and Virginia. The oyster, fish and crab industries employ many thousands and in these lines the motor boats play a most important part. In Maryland the law prohibits the use of other than sail power in the dredging of oysters, but in Virginia, where the "rocks" and "bottoms" are leased, there is no restriction and there are at least 75 motor dredgers hailing from Hampton alone.

While the Maryland dredger may not

use power, not even to propel his boat to or from the grounds, the tonger, who works in 18 ft. of water or less, has found the gasoline motor to be a great

AUXILIARY "BUGEYE" EMMA.

boon. Not only does the power aid the tonger in reaching the "rocks" and putting him and his "jag" of oysters along side of the buy boat, but it saves him hours of valuable time, enabling him to reach the "rocks" earlier and remain longer, thus materially increasing his chances for a good catch.

The followers of the water on the Chesapeake have but little idle time. The oyster season lasts from Sept. 15 to April 30. Then follows the fish and crabs that fill in the summer until about the first of August.

The first motor propelled work boat was a little buckeye named the No Name, owned by Henry Wickert, of Bodkin Creek, Md., who, in 1894, installed a four-h. p. White & Middleton motor. He was the pioneer in the employment of the internal combustion engine in commerce on the Chesapeake and he used her to run produce from his farm to Baltimore, making his trips with such regularity that his example was speedily followed.

The No Name was but 35 ft. over all, but the second vessel to enter the business created considerable talk, for she was not only the first motor barge to be built on the Chesapeake, but she was the largest that had ever been built anywhere and was powered with the largest and most powerful marine motor to that time. This barge was the Elizabeth, built by C. Durm & Son, at Baltimore, for Robert Turner, of Betterton, Md. She was 91.6 ft. over all, 21.6-ft. beam and 5.6-ft. depth, driven by a 60-h. p. White & Middleton engine.

About the same time, at Crisfield, there was being fitted out a big side-wheel gasoline craft, the Bertie E. Tull,

PRINCESS.

163 tons, which is still in commission and which is the largest of the liquid fuel boats on the bay. The Tull is 125.4 ft. over all, 30-ft. beam over guards, and 6.1-ft. depth. As a side-wheeler, operated with a pair of 60-h. p. motors of the stationary type, she was a commercial failure and for a number of years she was laid up. About four years ago, she changed owners, was equipped with a 60-h. p. Globe motor driving a propeller, and she is now successful, running a route between Baltimore and the Sassafras river.

One of the best examples of a general passenger and freight boat is the Princess, 113 tons, which was built at Cambridge in 1907 and which plies along the western shore of Maryland. She is owned by Capt. John Reed, who has a fleet of several motor craft, and she is a familiar sight on the Patapsco. She is 110 ft. over all, 23.3-ft. beam and 6.7-ft. depth, driven by a 125-h. p. Harris motor.

A type that has many counterparts is the Leader, a sturdy representative of the "down-the-bay" shipyard, having been built at Madison, Md., in 1904. She is of 39-ton register, 70 ft. over all, 18.6-ft. beam and 3.4-ft. depth, driven by a 35-h. p. Globe motor.

The Lauretta Curran, 23 tons, is also a product of Madison and a feature about her is the sail she carries. This canvas is not calculated to be used save when the wind is following, but then, in a good breeze, it helps wonderfully. Besides the mast is useful as a derrick for loading and discharging. The Curran is 60 ft. over all, 18.3-ft. beam and 3.8-ft. depth, driven by a 30-h. p. Globe motor.

Another motor barge that carries a sail is the Nettie A. Ruark, which hails from Crisfield and which was built at Fishing Creek, Md., in 1906. She is

14 tons register, 50.5 ft. long, 15.7-ft. beam and 3.8-ft. depth. She is a dead rise model, a popular model because of cheapness of construction, and is driven by a 30-h. p. Regal motor.

There is also a large number of gasoline auxiliary craft on the bay and of these the majority are "buckeyes," or, as they are commonly called, "bugeyes." These craft, with their leg of mutton sails, are easily handled by two men and they are ideal for general freighting, being swift in light airs and capable of carrying sail a long time when it blows. For their tonnage they are much easier handled than a schooner would be and they are preferable because of this.

A splendid type of the "buckeye" is the Emma, an auxiliary that finds employment all the year around. In the months from September until the latter part of April she is in the oyster business as a buy boat, in the spring and summer she runs fish and after that she runs grain, so that she has no idle time.

The power yawl has become a most important feature during the past couple of years. Vessels of 15 tons or upward with auxiliary engines are compelled, by law, to carry licensed pilots and engineers. Besides that it has been found that a four or five-h. p. engine in a yawl will push a big vessel faster than a 10 or 12-h. p. engine in the larger craft. That not only means the doing away with the licensed men, but it also means the saving of much fuel. More than that it gives the use of the small boat for the usual purposes, saving rowing for the crew.

When not in use, these power yawls are either carried on davits across the sterns or are slung on deck and they are no more in the way than an ordinary boat would be, the difference in weight being but little consequence. When the wind drops, it is the work of but a few minutes to sling the yawl over the side, tuck its nose under the counter, or to hold it alongside, and let it chug away, pushing the bigger boat along at least two miles an hour, all of which counts in the long run.

Although the Maryland dredger cannot use an engine to propel his craft to, on or from the "rocks," he has found use for the gasoline engine, employing it to wind in the dredges. There are at present fully 100 dredgers so equipped and everyone of them have proven to be successful, not only making larger catches, but saving money. One of these dredges will do the work of four men and do it better, quicker and cheaper.

Latest Argentine Battleships

(Translated by *The Navy* from La Nacion, Buenos Ayres.)

THE normal displacement under ordinary conditions is 26,500 tons, but the trial displacement with all weights complete and 1,600 tons of coal (40 per cent of the total) will be 27,500 tons.* This large displacement will make the vessels very seaworthy and insure them a high offensive and defensive efficiency; such displacement being in accordance with the latest types under construction, the Arkansas and Wyoming of the United States navy, of 26,000 to 26,400 tons; the Hercules and Colossus of the British navy, of 24,000 to 25,000 tons (but with only ten 12-in. guns); and the Lion, also of the British navy, with a displacement of 26,000 tons, on all of which the main battery is arranged to fire on either side.

Hull.

Will be of the following dimensions: Length, 585 ft.; breadth, 98 ft.; normal draught, 27 ft. 6 in.

The heights above the normal water line will be as follows: Forecastle, 25 ft. 6 in.; amidship, 22 ft. 8 in; astern, 17 ft. 1 in.

These heights agree with those of English and American Dreadnoughts, as it is generally conceded that a forecastle lower than 20 ft. would impair seaworthiness. Externally our ships will appear much like the British Lion, whose keel has just been laid at the dockyard at Devonport, or much like the Arkansas and Wyoming now building for the United States navy at the yard of the New York Ship Building Co., and Cramp's, respectively. The superstructure on the upper deck will be completely suppressed, to avoid obstruction to the arc of fire of the main guns, as well as to reduce the target surface.

Starboard waist gun: Fires across ship 60 degrees forward of beam and 40 degrees abaft.

Port waist gun: Fires across ship 60 degrees abaft of beam and 40 degrees forward.

Armor.

For the protection of machinery and boilers there will be a main armor belt, of 12-in. uniform thickness, 200 ft. long, and extending 4 ft. 9 in. above and 3 ft. 4 in. below the normal water line.

This belt will be continued 75 ft. more at each end, till it comes abreast of the extreme turrets, but its thickness is reduced to 10 in. These belts will taper down from their original thickness to a thickness of 5 in. at the lower edge in a height of about 2 ft. On top of the main belt, for its whole length of 400 ft. there will be armor 9 in. thick at its lower edge, tapering down to 8 in. at the upper deck. Beyond the central redoubt the armor belt will be 6 in. thick forward and 4 in. thick abaft and will extend from the same depth below the water line up to gun deck. Besides the main belt and the side armor extending between the centers of the extreme turrets, there will be also, at the level of said turrets, some transverse armor extending from side to side, thus completing the armored box that will protect machinery, boiler, magazines, the main and secondary batteries. Above the upper deck there will be armor 6 in. thick for protection of the 6-in. guns. To avoid all dangers inherent to perforation of the smoke-stacks, same will be protected by 1½ in. nickel steel extending from their base up to 15 ft. above the upper deck. The arrangement of armor follows English, American, and Japanese ideas; but, as regards thickness and distribution, it resembles what has been adopted on the Japanese ships now building. The total weight of all armor, barbettes, turrets, etc., amounts to about 7,000 tons.

Underwater Protection.

Six hundred tons nickel steel has been allotted for this purpose, and it will be used for an inner bottom and two longitudinal bulkheads, one on each side. This protection will be completed by the ordinary double bottom and the system of transverse and longitudinal bulkheads, dividing the ship into numerous water-tight compartments fitted with electrically driven centrifugal pumps which can be operated even when the compartment is entirely flooded. Externally a steel torpedo net is held 30 ft. from the ship's sides.

Machinery and Coal Bunkers.

The motive power is composed of steam turbines, located in three separate and independent compartments. The main boilers are arranged in six compartments, three forward and three abaft of the engine rooms. In the case of serious accident to the

*Revised figures for displacement are: Normal, 27,500 tons; full load, 30,200 tons.

wing turbines, this arrangement of machinery allows the use of the central turbine, which can develop more than one third of the total power, while the sub-division of the main boilers in two groups always allows the use of at least one-half the boiler power and at the same time permits an ideal arrangement of coal bunkers.

The coal bunkers run alongside and above the boilers; and on each fireroom there is also a transverse bunker for use in action; when owing to the easier handling of the coal, it will be possible to attain the maximum speed.

The coal bunkers have a total capacity of 4,000 tons and the oil tanks in the double bottom will contain 660 tons of fuel oil.

Speed, Trials, and Radius of Action.

The main turbines can develop 39,500 H. P. with 1 in. of air in the firerooms, but the blowers will be required to produce a pressure of 2 in. of water. With a displacement of 27,500 tons, this power will give the ship a speed of 22½ knots, which is to be maintained for 8 hours. Besides this trial, which is to be considered as the most severe and which will amply insure the ship a speed of 22½ knots under ordinary service conditions, there will be a 30-hour endurance trial at 20 knots, and a 30-hour coal consumption trial at 15 knots. All these trials will be preceded by the necessary preliminary trials. The radius of action on coal only is to be 10,100 knots at 11 knots speed, 7,200 knots at 15 knots speed, and 3,600 knots at 22.5 knots. If the high speed trial were conducted under ordinary load conditions, the displacement would be 26,500 tons, instead of the required trial displacement of 27,500 tons, and the corresponding speed at the reduced displacement would be nearly 23 knots.

Artillery and Torpedoes.

The main battery consists of 12 12-in. 50-caliber guns, mounted in pairs in six turrets arranged so as to fire all on either side; twelve 6-in. 50-caliber guns installed in the central casemate, six on each side; and twelve 4-in. 50-caliber guns, besides smaller field and saluting guns. The 12-in. gun turrets will have a protection of 12-in. armor in front, 9-in. armor at sides, 11-in. armor at back, and 3-in. armor on top.

The circular barbettes, which serve as support to the turrets, are 9 in. thick. The armor and guns will be manufactured by the Bethlehem Steel Co.

Follows some gun data:

Caliber of guns.	Weight of shell, kg.	Initial velocity mt. per sec.	Muzzle energy tons— meters.	Shots per min. per gun.
12-in.	349.2	914.4	16,890	2
6-in.	47.6	914.4	2,028	6 to 8
4-in.	15	914.4	640	12

The 12-in. guns are capable of perforating an armor plate of cemented steel 14 in. thick at 6,000 meters.

The magazines have a capacity of 120 rounds for each of the 12-in. guns, 300 rounds for each of the 6-in. guns, and 350 rounds for each of the 4-in. guns.

The axis of 12-in. guns above the water line is as follows:

Turret No. 1 forward 31 ft. 8 in.
Turret No. 2 forward 39 ft. 8 in.
Turret No. 3 forward 31 ft. 8 in.
Turret No. 4 forward 31 ft. 8 in.
Turret No. 5 forward 31 ft. 8 in.
Turret No. 6 forward 22 ft. 5 in.

The axis of the 6-in. guns is 19 ft. 6 in. above the normal water line and was fixed to overcome the faults observed with lower batteries, which in rough weather are practically useless, owing to the necessity of closing the gun ports. The 4-in. guns and munitions are equal to and interchangeable with the same size used on the destroyers, which will be manufactured by the same concern. These ships will be fitted with two 21-in. submerged torpedo tubes using torpedoes equal to those that will be used on the destroyers.

Conning and Fire Control Towers.

There will be two conning towers, one forward of 12-in. armor and one abaft of 9-in. armor. The fire control towers will be located as follows: One on the auxiliary mast, one above each conning tower, one auxiliary station on each side of the ship on small independent armored turrets; one main central station within the casemate under the protective deck.

Miscellaneous.

The upper and lower protective deck will have 1½-in. and 3-in. armor. The electric power will be supplied by two main stations in duplicate, each fitted with turbo-dynamos capable of generating all the power required in action, and located within the armored casemate. There will also be a third installation, operated by heavy oil motors, of sufficient power to illuminate the ship and also to handle some of the turrets for practice. This station will obviate the necessity of maintaining boilers under pressure for auxiliary service in the harbor, which ought to result in better preservation of boilers and steam piping. Searchlights of sufficient number and power will be conveniently located.

Memorandum of Argentine Ships.

Tonnage, 27,500 normal.
Speed, 22½ knots.
Main belt armor, 12 in. thick.
Price per ship, £2,190,000 sterling.
Time of completion, 24 and 27 months.
Armament, 12 12-in. guns in turrets (50 cal.), 12 6-in., 12 4-in.
Machinery, 3 Curtis turbines of 40,000 H. P.
Boilers, B. & W. watertube.
Ships can fire twelve 12-in. guns on either broadside—8 ahead and 8 astern.

One vessel will be built at the Fore River Ship Building Co., in 24 months, and the second vessel at the works of the New York Ship Building Co., in 27 months, both vessels to be designed and engined by the Fore River Ship Building Co.

Britain's Largest Battleship Launched

On Saturday, Aug. 6, the battleship cruiser Lion was launched from the government dock yard at Davenport. The vessel is not only the largest warship in the British Navy, but she is easily the fastest and most formidable armoured cruiser afloat. Although officially termed a cruiser, her broadside fire of eight 12-inch guns will be as heavy as the Dreadnought's, notwithstanding that she will mount only eight in all of the big weapons, as against the ten of the latest British battleships. Her over all length is 700 ft. by 86 ft. 6 in. beam, as compared with the Lusitania and Mauretania's length over all of 790 ft., and beam of 88 ft. The great stride in size represented by the Lion is shown by the following table, comparing her dimensions with those of the Indefatigable, Britain's latest armored cruiser prior to Saturday's launch:

	H.M.S. Lion.	H.M.S. Indefatigable.
Length	700 ft.	596 ft.
Beam	86 ft. 6 in.	80 ft.
Displacement	26,350 tons	18,750 tons
Designed speed	28 knots	25 knots
Horsepower	70,000	45,000

The propelling machinery consists of Parsons' steam turbines, driving four screws, and giving an estimated shaft horsepower of 70,000. Her steam generating installation will consist of 42 water tube boilers. This propelling machinery—the most powerful in any vessel so far constructed—is being supplied by Messrs. Vickers, Sons & Maxim, Barrow.

The main armament comprises eight 12-in., 50-caliber guns, mounted in pairs, all four turrets being on the middle line of the ship. The guns in each of the inner turrets can be fired over the outer turrets, and, owing to the greatly increased deck area, the striking power shows a great improvement over that of the Indefatigable's guns. The armor

consists of a long, deep belt, 9 in. thick, with an armored bulkhead at each end. This belt is 3 in. less in thickness than the maximum of the side armor of the Dreadnought battleships, but is 2 in. thicker than that of the armored cruisers Indefatigable and Invincible. From the foregoing description, it will be seen that the British Admiralty may claim that in the Lion they have made an enormous advance in all the essentials of an armored cruiser—speed, gun power, and protection—but at a cost of over two millions sterling, or, say, the price of two first-class battleships of only a few years ago.

The hull and propelling machinery of the Princess Royal, a sister ship to the Lion, is now under construction by Messrs. Vickers, Sons & Maxim, Barrow-in-Furness.

A LARGE BLACKSMITH SHOP USING OIL FUEL EXCLUSIVELY

A Modern Pacific Coast Plant and Its Unique Liquid Fuel Equipment and Shop System

By Holden A. Evans, Naval Constructor United States Navy.

Continued from August Issue.

THE author not only believes in a thorough detail analysis of the work to be accomplished and careful consideration of the best methods for obtaining the results desired, but also realizes fully that it is impossible to obtain the maximum output from men unless they are well rewarded. It is a long step, however, from the conditions usually found to those which we know to be possible. It is more difficult to make radical changes in methods in government shops than in commercial shops, and it must be realized that the progress of scientific shop management is slow in commercial shops as well as in government establishments. There are a large number of shops of various kinds under my supervision, and to obtain the best results in reasonable time would require the services of highly paid experts to work out the best organization in each shop. I felt that the time had not yet come for such experts, and that the haphazard go-as-you-please methods could be improved by myself and my assistants without interruption to the work of the department under my charge. About five years ago I began this work, and one of the first steps was to get my assistants equally interested in the subject of scientific shop management. The effort was successful, and we have been able to take shop by shop, and make improvements, and note the good results obtained. In describing the system followed in the blacksmith shop, I wish to emphasize that the improvements made are really but the first steps towards scientific management, and are merely the introduction of a systematic and logical method of handling the work where none existed before. Unfortunately the same conditions exist in the great majority of the jobbing smith shops throughout the country. The methods now employed in the shop under discussion are simple and can be used in almost any shop, but

Fig. 18—Heavy Forge Shop, South Wing.

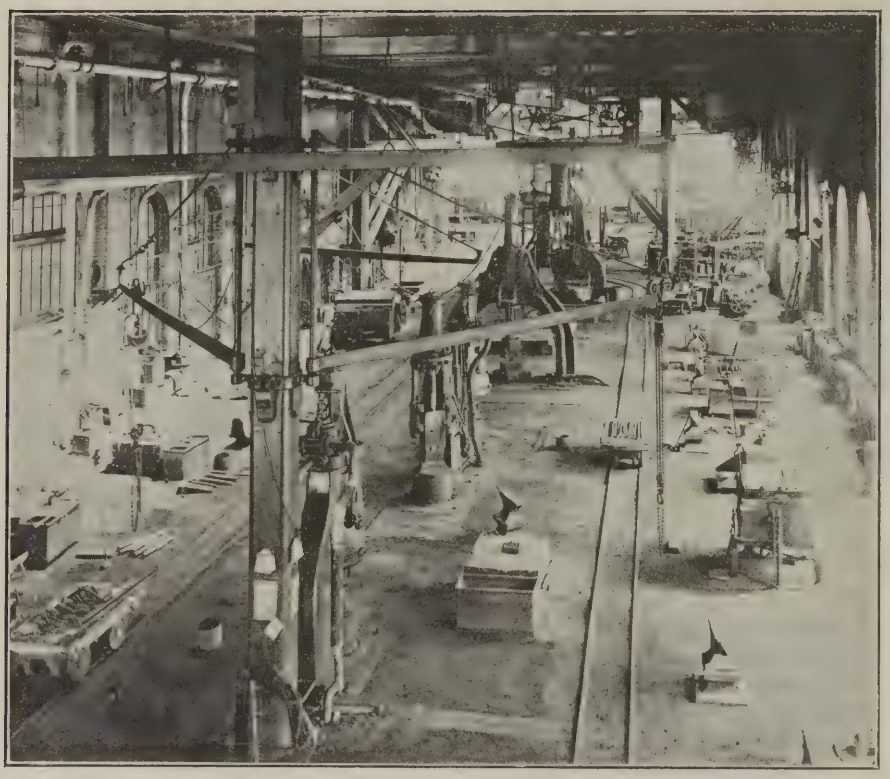


FIG. 19—VIEW IN MEDIUM HEAVY WORK SMITH SHOPS IN WEST WING (NOTE HOLDER FOR INSTRUCTION CARDS ON POST IN FOREGROUND).

are recommended only as the first step toward scientific management.

The duties of the foreman and others, and the routine followed, are laid out in detail in written instructions issued to the shop, and in the description which follows these instructions will be freely quoted.

Foreman's Responsibility and General Duties.

The foreman is held directly resonsible for all work in his department. He is expected to maintain the highest efficiency possible in his organization. Owing to his superior mechanical ability he is expected to devise schemes and methods equal, and, if possible, superior to those in other large plants handling similar work. He will make a study of the special ability of each individual mechanic.

He will in person receive all orders for work to be executed in his department. Upon receipt of job orders or shop orders, he will go over each and designate to whom the work shall be assigned, giving the necessary instructions, and note particularly any peculiarity or unusual conditions regarding the work, furnishing the data necessary for the routeman to make out the instruction cards intelligently.

He will see that all material received from the storehouse corresponds in quantity and quality with that ordered, utilizing the third copy of the requisition for this purpose. He is responsible that the material used is suitable for the work.

He will utilize any special tools on hand that can be used to advantage, and if none are available and he considers it desirable to make such tools for a job, he will request the necessary authority from the shop superintendent. In other words, the foreman will give each job order his personal attention and study, assuring himself that all details have been arranged to enable the work to be completed expeditiously and economically.

These instructions are not to be construed to make an office clerk of the foreman. It is intended that every job to be accomplished shall be analyzed and planned by the foreman before being undertaken in order that each may receive the benefit of his experience and knowledge.

In carrying out these duties the foreman will have the assistance of two assistant foremen on the floor of the shop, one in charge of all small work in the north end of the shop, and the other in charge of the heavy work, the bolt machines and the tool department in the south end of the shop. He will also be assisted by a route-man, an office clerk, a material and move man, and a messenger boy. The duties of the various assistants to the foreman are as follows:

Assistant Foremen.

Each assistant foreman is responsible to the foreman for all work performed in his division. It is his duty to see that each workman properly understands the work assigned to him, and he will supply the workmen with all information necessary to carry out the directions given on the instruction cards. He will see that each workman has at least one job ahead with the necessary stock at the forge and with the necessary templates, sketches, or plans, in order that the work may be immediately taken up when the job in hand is completed. When a new

FIG. 20—SMITH SHOP, NORTH WING, SMALL HAMMERS PLACED BACK TO BACK TO ECONOMIZE SPACE.

instruction card is issued, it is the duty of the assistant foreman to decide upon the detailed methods to be followed to carry out the instructions, and the proper size and amount of material required. In ordering stock the assistant will use an order slip, giving the size and amount of stock required, the job order number, and the forge at which the material should be placed. This slip will be dated and signed by the assistant foreman and will be given to the material and move man. If, in any case, he is in doubt, the foreman will be immediately consulted. The assistant will inspect all finished work before it leaves the forge, and will attach a tag giving the necessary information to enable the move-man to move the work to its proper place.

The route man will carry out the details of routing the work from the data contained in the job order or shop order, and the instructions given by the foreman. He will make out and issue the instruction cards and make out the standing order cards for the same. He will keep the route board in the foreman's office to conform to the exact condition of the work in the shop. He will keep the order file up to date, filing promptly orders that have been routed and removing orders that have been completed. He will keep the "tickler" file for promises made to other shops, or promises made by other shops. The route-man will make sketches when necessary to issue with the instruction cards. He will index and file all plans received in the shop.

Office Clerk.

The office clerk will keep the records of the men, attend to the time cards, check the records of time given on the instruction cards and file the same. He will make out requisitions for material from the storehouse as called for on the order slips furnished by the material and move-man. He will keep the "orders to foremen" files up to date and perform all clerical work required in connection with the work of the shop.

The material and move-man will keep an accurate record on the stock cards of the material on hand. He will see that all requests from the assistant foremen for material are immediately supplied exactly as called for and that it is delivered to the forge specified on the order slip. The order slips will be turned over to the office clerk daily. He will keep a record of the fire bricks used by each forge and furnace; he will record the oil meter readings; he will remove finished work from the forge to the station specified on the tag attached to the work. A laborer will be assigned to him as an assistant, and when he requires additional labor to handle heavy stock the assistant foreman will supply the necessary men.

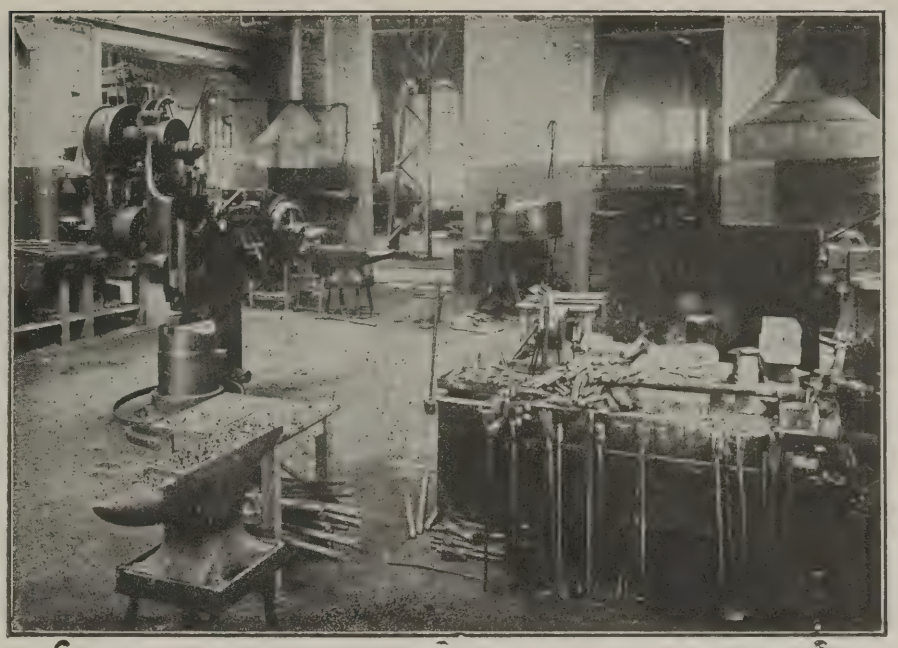


FIG. 21—TOOL DRESSING AND TEMPERING DEPARTMENT.

FIG. 22—REAR OF SMITH SHOP, SHOWING TOOL AND STOCK RACKS.

Routine for Handling Work.

All work is ordered from the smith shop, either by job order, Fig. 25, from the main office, or by shop order, Fig. 26, from another shop. The shop orders are based on job orders issued by the main office to other shops. As the greater part of the work consists of repairs where the smith work is only a small part of the job, the greater portion of the work in the smith shop is on shop orders from other shops. The shop order shown in Fig. 26 requires but little explanation, but it requires considerable educational work to have the orders properly issued. Some trouble was experienced in getting the foreman issuing the order to fill in the date that the work would actually be required. It required no investigation or thought to fill in "as soon as possible," or "immediately," and a great many orders were made out in this way in the beginning. The greatest difficulty, however, was experienced in getting the foremen receiving the order to make an intelligent promise. When first used it was found that promised dates of completion were, in some cases, made without the foreman knowing the work to be accomplished, and in

FIG. 23—MISCELLANEOUS SMALL WORK SMITH SHOP, NORTH WING.

nearly all cases were made with but little consideration of the job itself, or of other work in the shop. In other words, we had added red tape and accomplished nothing. With a little education and constant watchfulness, this was corrected. At present care is taken that the date given on which the work should be completed is reasonable, and is the time that the work should be delivered, and the promised date of completion is only given after the work is carefully sized up. If the date is beyond the date on which the work is required, the foreman requiring the work is immediately telephoned and, if the question is not satisfactorily arranged, it is immediately referred to the shop superintendent. A tickler file is kept in each shop of promises made and promises due, and failures to keep promises are reported to the shop superintendent.

All shop orders and job orders go direct to the foreman, who studies each job and notes on the back of the order such instructions as he thinks necessary. He also assigns the work, which he is able to do, for the standing order board in his office, which will be described later, shows the work assigned to each forge or furnace. The orders then go to the route-man, who makes out the instruction cards which are to go to the men, and the standing order slips which are to go to the standing order board in the foreman's office. In the photograph on page 82, the foreman's office is shown. In Figs. 23 and 24 the route board and file case are shown. The instruction card is given in Fig. 27 and is self-explanatory. At each forge or furnace, there is a metal holder with places for three of these cards, all cards being in view. The top card is the one on which the man is working, the second is the next job for which material, tools, drawings, etc., have been provided. The third card is work assigned, for which material, tools and information are being collected. Each workman in charge of a gang records on this card the time actually spent on the job. For each instruction card there is a corresponding standing order slip which contains a brief of the job, the job numbers, and the forge to which the work is assigned and the slip, shown in Fig. 28, goes to the standing order board. The standing order board is divided up for the various forges and furnaces, and has the numbers of the various men in charge of gangs over hooks on which the order slips hang. The board also is provided with file cases for active and inactive orders, and pigeon holes for instruction cards made out, but not assigned, and pigeon holes for completed instruction cards.

When there are already three jobs at a forge, the instruction card with the standing order slip pinned to it is placed in a pigeon hole under the proper heading. The foreman can at a glance at the standing order board tell the condition of the work in the shop. He can see where each job is and the amount of work in the shop

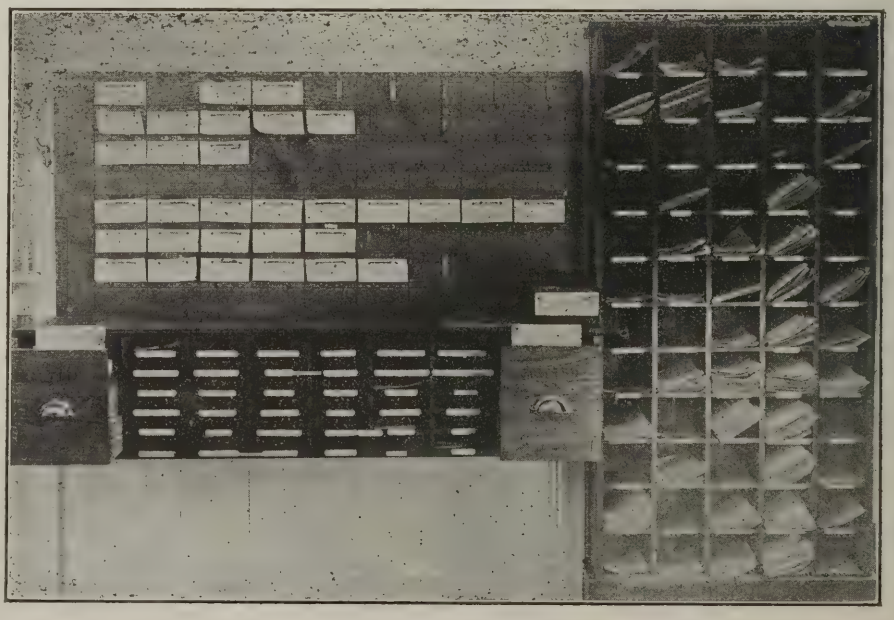


FIG. 24—STANDING ORDER BOARD IN FOREMAN'S OFFICE. (FROM THIS THE LOCATION AND STATUS OF EACH JOB CAN BE QUICKLY DETERMINED).

Job Order No. 45/118 Title D Sub-Title IRIS

Appropriation C&R 1910 Gen'l Head H & E - W & M

NAVY YARD, MARE ISLAND, CAL.,

Hull Division May 11/10 19

Sir:- You will please make one boat davit and deliver to

store for shipment for after davit of first cutter. Use old davit now on yard scrap heap, which can be bent and fitted in conformity with attached sketch.

NOTE: This work must be completed and davit delivered to the General Storekeeper by Friday noon, May 13, 1910.

	ESTIMATED COST	ACTUAL COST
Labor	16 00	
Material	2 00	
Indirect	12 00	
Total	30 00 3 d	

Authority Commandant's 3d end. of May 10/10 No 861

Date of Completion

To Master Shipsmith

Respectfully,

H. A. Evans
Naval Constructor,

To be returned to office upon completion of work U.S.N.

Fig. 25—Main Office Job Order. All Work is Ordered in This Manner.

MFG: DEPT. 1101 NAVY YARD, MARE ISLAND, CAL.

SHOP ORDER. April 12-10

OUTPUT ACCOUNT

JOB ORDER No. 115/107 APPROPRIATION C&R

TITLE D SUBTITLE Calif GENERAL HEAD Coaling Typd

TO Shipsmith SHOP.

You will do the following work charging labor and material, as above:

Furnish labor and material to make one Coaling tripod as called for on plan # 6813

WORK SHOULD BE COMPLETED BY May 19-10

R H Thurman

FOREMAN Machine SHOP 2

ORIGINAL AND DUPLICATE TO BE FORWARDED TO SHOP IN WHICH WORK IS TO BE DONE. FOREMAN RECEIVING ORDER WILL PUT IN DATE OF RECEIPT AND DATE ON WHICH WORK WILL BE COMPLETED. RETAIN ORIGINAL AND IMMEDIATELY RETURN DUPLICATE. WHEN JOB IS COMPLETED FOREMAN DOING WORK WILL FILL IN ACTUAL DATE OF COMPLETION AND FORWARD TO SHOP THAT ISSUED THE ORDER AND IF WORK IS SATISFACTORY ORDER WILL BE INITIALED AND RETURNED TO THE FOREMAN WHO DID THE WORK

ORDER WAS RECEIVED April 12-10 AND THE WORK

WILL BE COMPLETED May 19-10 FOREMAN E.M.

WORK ACTUALLY COMPLETED May 19-10 FOREMAN E.M.

IS WORK SATISFACTORY? Yes. O.K.

R H Thurman

FOREMAN

Fig. 26—Shop Order for Output Account. Based on a Job Order Already Issued to Another Shop. (In Duplicate.)

not yet assigned to a forge. From this inspection and consultation with his tickler file of promises he can learn whether he should take on some additional men or change some of the assignments already made to give preference to work at an early date.

The assistant foreman in charge of a division begins the assembly of tools, drawings and material, as soon as a new instruction card is issued. He makes out a "minor material" slip, Fig. 29, the material required and he gives this to the material man. If the material is on hand in the shop stock it is drawn, and if not the office clerk is notified and it is ordered from the main store.

When a job is completed the man in charge of the gang, after entering the time of the gang, removes the card from the holder and hangs it on a hook provided and moves up his next card and starts his job. The assistant foreman inspects the completed job, initials the instruction card, and attaches to the work a tag bearing his inspection mark and designating the place to where the work will be moved. The material man moves the work and takes the instruction card to the office and places it in the basket provided on the desk of the route man. The route man removes the standing order slip from the route board and the order for the work from the file, pins the latter to the instruction card and places the two in a basket provided on the desk of the foreman. The foreman will close the job, returning the order with the date of completion marked. The costs of direct labor as shown by the instruction cards will be scrutinized and compared with previous costs, and then will be indexed and filed. The shop superintendent goes over these

MFG DEPT NO 1101

CHECK No. 2113 JOB ORDER No. 115/107

ARTICLE Fittings for one Coaling Boom

ISSUED 4-13 1910 COMPLETED 4-18 1910 BY E.M. forge #25

INSTRUCTIONS

Forge all fittings called for on plan # 6813

Finished forgings to be delivered to # 2112-forge 36

DATE	RT	HR	DATE	RT.	HR.	DATE	RT	HR	DATE	RT	HR	DATE	RT	HR.
4-14-10	53	8	4-15-10	53	2	4-18-10	53	6						
"	36	8	"	36	2	"	36	6						
"	36	8	"	36	2									

Fig. 27—Instruction Card Issued to the Workman.

MFG. DEPT. 614

STANDING ORDER

J. O No. 115/107

Machine No. 2113-Forge #25 Date, 4-13 1910

Name of Piece and Operation

Forge fittings for coaling boom

FIG. 28—STANDING ORDER SLIP. THIS IS PLACED ON THE STANDING ORDER BOARD AND SHOWS LOCATION OF WORK.

MFG. DEPT

MINOR MATERIAL

Ship California Date 4-13-10

Job Order No. 115/107

Deliver 265 lbs. 3"x3" Mild steel to Millet, forge #25

LEADING MAN

FIG. 29—MATERIAL SLIP FURNISHED TO THE MATERIAL MAN BY ASSISTANT FOREMAN.

JOB NO. 115/107

OBJECT California Coaling booms forging fittings

DATE 5-11-10

CHECK NO. 2172

NAME Greenwood

PAY 4.24

HOURS 8

TOTAL 8

APPROVED BY:-

(ENTER BUT ONE JOB ORDER ON EACH CARD)

FIG. 30—WORKMAN'S TIME CARD GOES TO MAIN OFFICE AFTER CHECKING BY ASSISTANT FOREMAN.

MFG. DEPT. NO. 708

ARTICLE 3/8 x 2" MILD STEEL

MAXIMUM 500# MINIMUM 100#

JOB ORDER NO.	ISSUED	RECEIVED	DATE	BALANCE	JOB ORDER NO.	ISSUED	RECEIVED	DATE	BALANCE
			1-12-10	480					
174/154	350		1-18-10	130					
39/140	45		1-21-10	85					
174/154		350	1-22	435					
3/140	80		2-3	355					
405-11 104	12		2-21	343					
39/140	60		3-4	283					
3/140		80	3-4	263					
39/140		105	3-8	468					
2501	40		3-21	428					

FIG. 31—STOCK CARD FOR SHOP STORE.

records frequently and picks out and has recorded such as can be used as standard costs.

In addition to the detail record of time kept on each job on the instruction cards, each man makes out his own time card, Fig. 30, for each job on which he works each day. These time slips go to the accounting department in the main office and from them the pay roll is made up. They are also posted under each shop to the job number and it is from this record that the total cost, including, usually, work in a number of shops, is obtained. The total pay roll each day is checked out against the total cost shown from the job order cost cards. It will thus be seen that there is some duplication in the records. This duplication pays for itself many times over, as it enables detail costs of each operation to be obtained, and it enables the foreman and shop superintendent to obtain immediately a job is completed the direct cost of each operation.

A reasonable stock of ordinary material is maintained in the shop store. The main supply of material is, however, in the main storehouse, which is drawn on for material not in the shop store, and for replenishing the latter. There is an accurate record kept of all material in the shop store. The records are kept on a stock card, Fig. 31, which shows all receipts and issues, and on the inven-

ARTICLE 3/8 x 2" MILD STEEL

MAXIMUM 500# MINIMUM 100#

DATE OF INVENTORY	ISSUED SINCE LAST INVENTORY	REC'D SINCE LAST INVENTORY	BAL. SHOWN ON STOCK CARD	INVENTORY COUNT	DIFF.	INVENTORY TAKEN BY
6/30-10			430#	480#	50+	[illegible]

FIG. 32—INVENTORY CARD FOR SHOP STORE.

S. & A. Form 129 A. 1-3-10—200m.

NAVAL SUPPLY FUND STUB REQUISITION

DATE 5-6-10 DEPARTMENT OF Smith Shop STUB NO. 25863

JOB ORDER	TITLE	SUBTITLE	APPROPRIATION	GENERAL HEAD
115/107	D.	Calif	C&R 1910	Coaling Gypsods

CHECKED BY ..... FOR MATERIALS AS FOLLOWS: PRICED BY .....

STOREMAN TO ENTER CALL OR INVOICE NO.	CLASS NO.	QUANTITY.	ITEM AND DESCRIPTION	UNIT PRICE	EXTENDED AMOUNT
		20 ft.	Pipe 2½" dia. black double extra strong steel	1.15	23.00
		18 ft.	Pipe 3" dia black double extra strong steel	1.60	28.80
		263 lbs.	3" sq. billet steel	.02	5.26
					57.06

FIG. 33—REQUISITION FOR MATERIAL FROM MAIN STOREHOUSE.

MFG. DEPT. 1102 NAVY YARD, MARE ISLAND, CAL.

SHOP ORDER. May 13-10

EXPENSE ACCOUNT

JOB ORDER No. S & M.

TO Machine SHOP. 2

ESTIMATED COST LABOR 60 00

ESTIMATED COST MATERIAL 10 00

TOTAL 70.00

APPROVED BY Cwfisher

INSTRUCTIONS.

ORIGINAL AND DUPLICATE TO BE FORWARDED TO THE FOREMAN WHO IS TO DO THE WORK, WHO WILL FILL IN THE ESTIMATE AND FORWARD BOTH COPIES TO THE OFFICER AUTHORIZED TO APPROVE THE WORK. AFTER APPROVAL BOTH COPIES WILL BE FORWARDED TO THE FOREMAN WHO IS TO DO THE WORK, WHO WILL FILL IN THE DATE OF RECEIPT AND DATE OF PROMISED COMPLETION, INITIAL, RETAIN ORIGINAL, FORWARD DUPLICATE TO SHOP REQUESTING WORK AND PROCEED WITH THE WORK.

2. WHEN COMPLETED, DATE OF COMPLETION WILL BE FILLED IN AND ORIGINAL FORWARDED TO FOREMAN REQUIRING WORK, WHO WILL EXAMINE WORK, STATE IF SATISFACTORY, INITIAL AND RETURN TO FOREMAN WHO DID THE WORK.

WORK REQUIRED.

Please furnish labor and material to repair broken casting on small Sellers Steam hammer in Smithery

WORK DESIRED COMPLETED BY 5-21-10

D. Monro

FOREMAN Shipsmith SHOP

ORDER WAS RECEIVED May 13-10, AND THE WORK WILL BE COMPLETED May 21-10 FOREMAN D.M.

WORK ACTUALLY COMPLETED 5-20-10 FOREMAN D.M.

IS WORK SATISFACTORY? Yes. O.K.

D. Monro

FOREMAN

FIG. 34—SHOP ORDER FOR REPAIRS ON TOOLS, ETC.

tory cards, Fig. 32, which are self-explanatory. No material is issued except on a material slip, signed by the foreman or one of the assistant foremen. These slips are turned in each night at the office for record. Material from the main storehouse is drawn on a requisition, Fig. 33, which is self-explanatory.

Results Obtained.

From the description it might be inferred that a complicated system is employed, but this is not the case. The methods followed are direct and simple and give excellent results.

Municipal Docks at Seattle

Preliminary plans and arrangements are being prepared by the city government of Tacoma, Wash., for a system of municipal docks to provide a public landing for all small craft. The site of the proposed docks is along the city waterway between Eleventh and Fifteenth streets, covering 1,440 ft. The project includes a fire-proof building, the lower floor to be used for freight, the second for passengers, and the third for storage.

A replat of the tide flats of Tacoma harbor fully described in THE MARINE REVIEW for June is in progress and a number of plans are being presented for future harbor development and a system of municipal docks. An attempt is being made to secure better transportation facilities to the tide flats by the construction of a new bridge on Eleventh street.

There are three salient points being considered. The first is to confine the Puyallup river, for the last 4,000 ft. of its course, to a scouring channel 100 ft. wide, instead of the 500-ft. width through which it now enters the sound. Two bulkheads 150 ft. apart are proposed, one forming the west wall of the scouring channel and the other the east wall of a still water channel, the latter to be 250 ft. wide, and between the two bulkheads, a fill of 26 ft. above low water. The still water channel is to be 35 ft. deep at low tide, available for the deepest draught steamers.

The second feature of the plan is to convert Sitcum avenue to a deep sea waterway, 4,000 ft. long. At an angle of 45 degrees from the east bank of this waterway are to be four slips, each 1,000 ft. long, 200 ft. wide, and 300 ft. apart. All wharf space between the slips on the east side of the Sitcum avenue waterway is to be city property.

The third feature is the opening of Puyallup boulevard from the intersection of Sitcum avenue and the inner harbor line to the main line of the Chicago, Milwaukee & Puget Sound railroad, three miles to the south. This boulevard is to be forever used by municipal railroad tracks, to touch the foot of each lateral slip from Sitcum waterway and to afford direct connection with every railroad now in the city or that may enter the city.

Heffernan Improvements at Seattle

In THE MARINE REVIEW of April, 1910, was noted the purchase of a large section of Seattle tide land by J. T. Heffernan, president of the Heffernan Dry Dock Co., and Heffernan Engine Works. As a second step in the establishment of his ship repair plant, Mr. Heffernan has purchased and moved to his plant the marine railway and ways formerly operated by the Seattle Ship Yards Co., at Ballard. The Heffernan Dry Dock Co. will move its floating dry dock, which is 385 ft. long and 100 ft. wide with a capacity of 8,000 tons, back and place the marine ways, which are 250 ft. long and 56 ft. wide with a capacity of 4,000 tons, adjoining the dock. This will enable them to handle vessels of all sizes quickly for repair work. The improvement of the tide land on the East Waterway includes the erection of a boiler shop and machine shops with all facilities for repair work. The machine shops of the Heffernan Engine Works will be moved to the new location as soon as the new plant is sufficiently far advanced and the Heffernan companies will specialize in repair work.

The Great Lakes Dredge & Dock Co., of Chicago, was the lowest bidder for excavation work to be done in Erie harbor, its bid being $42,960.

A PROPOSED METHOD FOR RAISING THE MAINE FROM HAVANA HARBOR

(From *The Engineering News.*)

IN THE session of Congress recently adjourned two bills were passed appropriating first $100,000 and then $200,000 additional to be expended under the direction of the engineer department, U. S. Army, in raising the wreck of the U. S. battleship Maine from her 12-year old berth in the bottom of Havana harbor. Owing to clerical inconsistencies in the second of these two bills, there at first was some doubt in the minds of the officials at Washington as to the legality of the $200,000 appropriation, but the Attorney-General, after examination of the matter, reported that the whole $300,000 is now available. Meanwhile the chief of engineers, Gen. W. H. Bixby, has under consideration a number of schemes for raising the ship and some definite plan will soon be adopted for the prosecution of the work.

Among the plans which have been submitted, one of the most practicable is that devised by John F. O'Rourke, M. Am. Soc. C. E., New York City, the well-known foundation and tunnel engineer. Mr. O'Rourke has had his idea patented and proposes to undertake the work for the government under the general direction of the army engineers, but with the force and equipment of the company of which he is president. In the present article, we are able to present the outlines of the plan and the details of the apparatus to be used.

The U. S. battleship Maine was sunk in about 35 ft. of water at her moorings in Havana harbor on Feb. 15, 1898, as a result of an explosion at the forward part of her hull. This explosion tore away the entire forward section of the vessel, but left the remainder intact and in that portion are still the bodies of some 200 of the crew who were drowned when the ship went down. The fact that the forward portion is so completely wrecked makes extremely difficult any method of raising, which involves the filling of the hull with compressed air and makes some style of coffer-dam pontoon or adjacent raising device almost necessary in the raising. The first style of salvage operation, in fact, is the only one which heretofore has been given much publicity in this particular wreck and was quite fully described in *Engineering News*, Dec. 8, 1904, page 520. At that time, a company was formed, which proposed to drive around the wreck a specially designed circular bi-walled coffer-dam, to pump out the dam and in the dry area to make the ship seaworthy. The scheme, however, never got far beyond the design stage. The pontoon scheme is complicated by the necessity for helmet-divers' work. The third scheme, that of adjacent solid docks from which the lifting operations may be carried on, is the basis of Mr. O'Rourke's idea, though the use of pneumatic caissons is the fundamental feature of the scheme.

The water at the site of the wreck is about 35 ft. deep and overlies a soft muddy bottom, into which the hull has sunk another 10 ft., and only the upper works now stick up above the water surface. Havana harbor is remarkably well protected and there is only about a 10-in. range of tide with hardly any wind or wave action, so that any operation, such as will be required by Mr. O'Rourke's scheme, will not be hampered by bad weather conditions.

In brief, Mr. O'Rourke's scheme consits in raising the Maine on a cradle of cables, slung under the ship by means of laterally placed pneumatic caissons

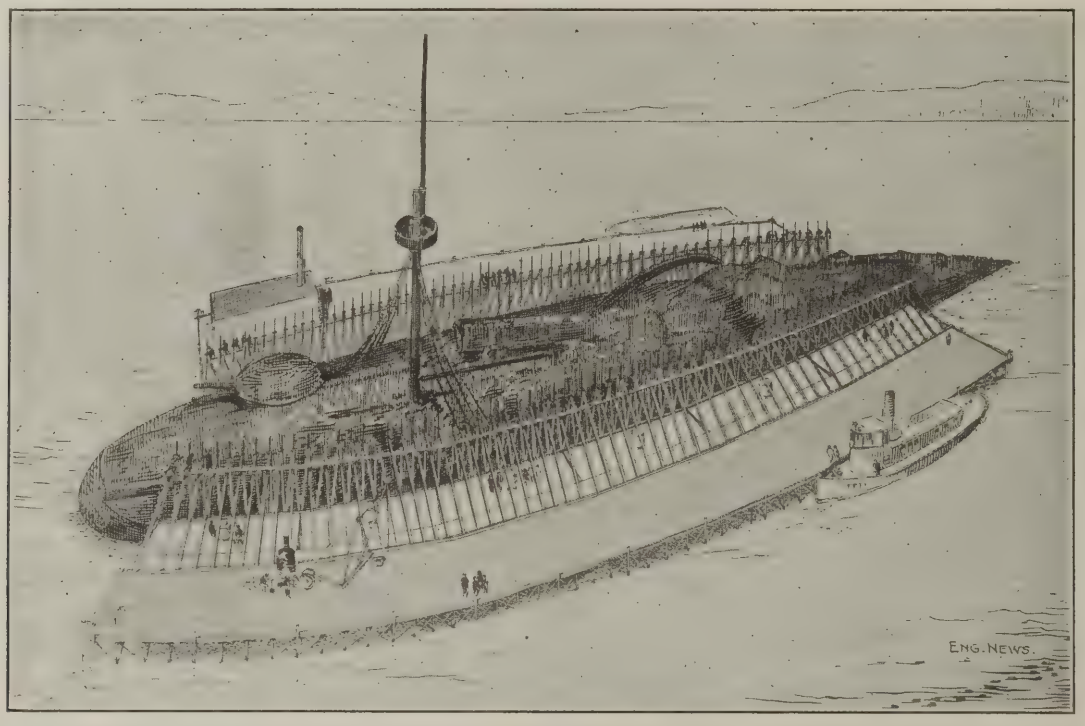


FIG. 1—PERSPECTIVE VIEW OF RAISING OPERATION PROPOSED BY JOHN F. O'ROURKE TO RAISE THE MAINE.

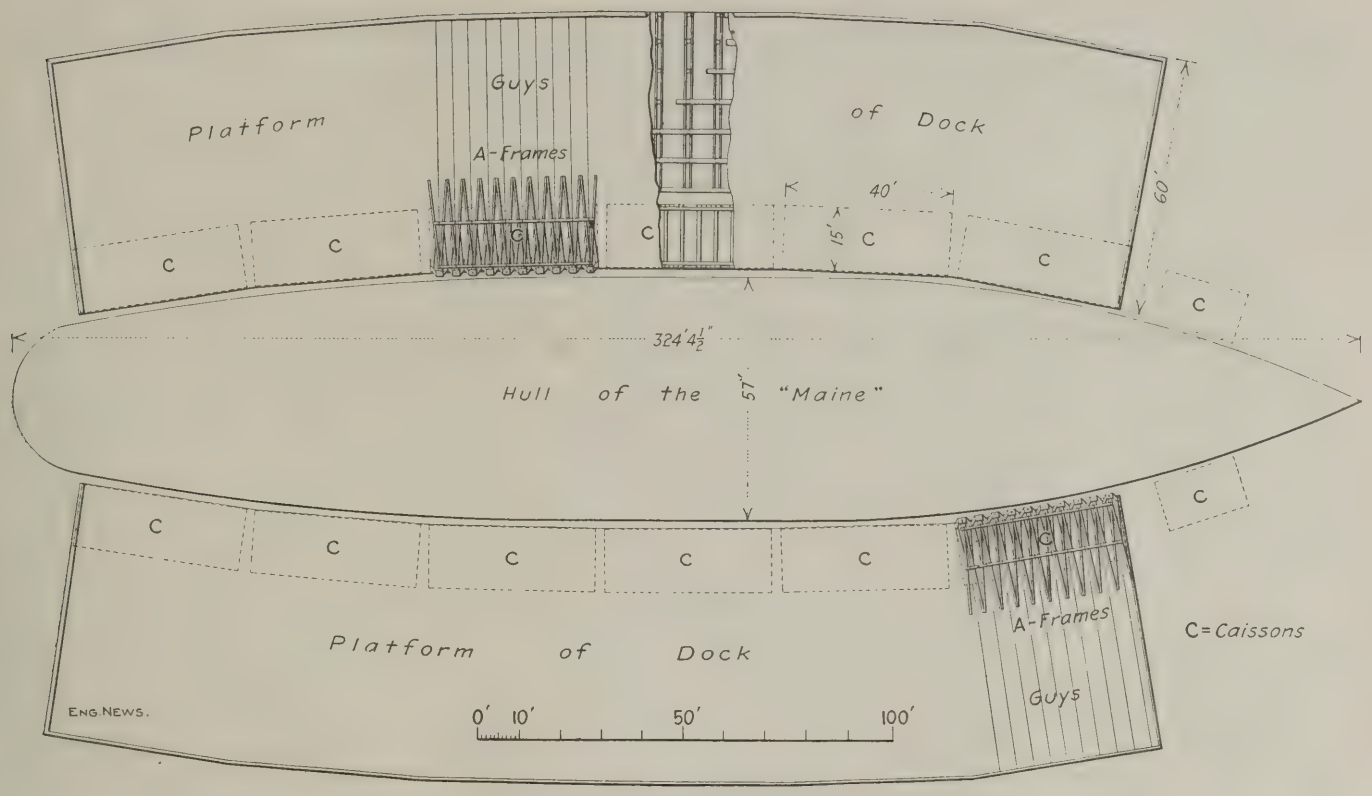


FIG. 2—PLAN OF DOCKS AND CAISSONS AROUND THE MAINE.

and carried from derricks resting on the top of these caissons. The accompanying illustrations will help the understanding of the following description. The first step will be to drive on either side of the wreck and about 20 ft. away from it, an ordinary pile and timber dock founded on straight and battered piles driven, as shown in Fig. 3, well down into the soft mud bottom of the harbor. These docks are to be some 40 ft. wide so that their outside edges will be about 60 ft. away from the sides of the vessel. The docks once built, there will be sunk in the space between each dock and the vessel a series of timber compressed-air caissons, each 15 x 40 ft. in plan. These caissons are to be sunk side by side, as drawn in the plan in Fig. 2, as near together as is possible and also as near to the side of the wreck as various projections thereon will permit. As at present designed, there are to be six of these caissons on each side, extending up to within some 60 ft. of the bow of the vessel. On account of the twisted and torn condition of the ship's frame work at this end, it is thought useless to attempt to continue the raising apparatus any farther forward, but in case it is found, after work has commenced, that such a continuation is desirable, it will be a simple matter to sink extra caissons near this portion of the wreck.

The caissons are to be of the ordinary

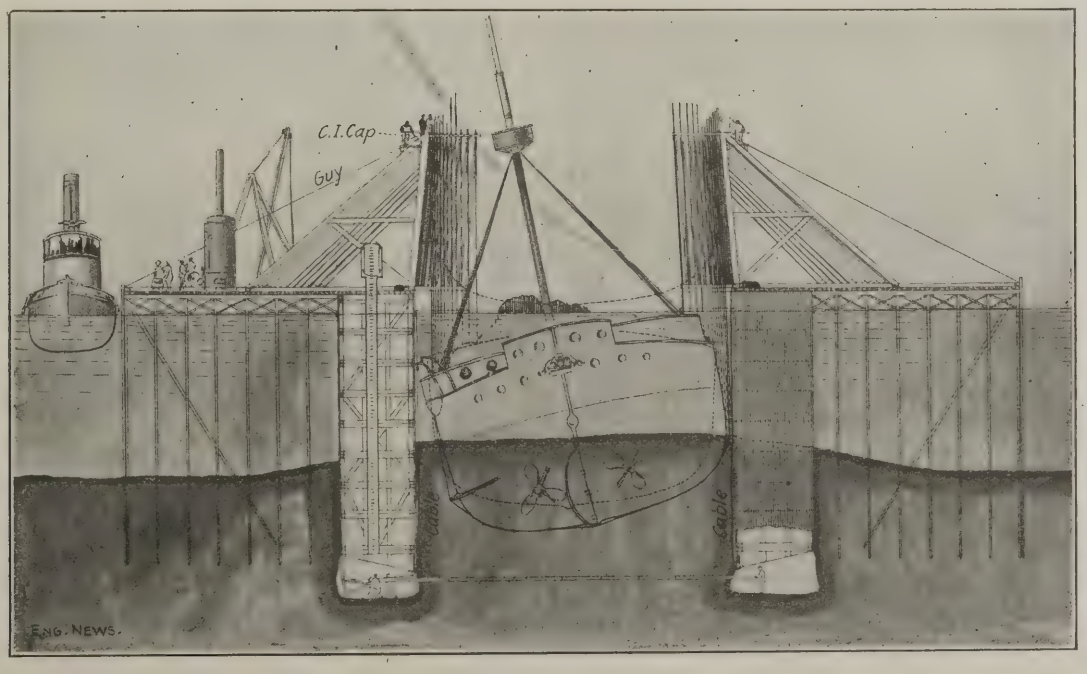


FIG. 3—SECTION THROUGH DOCKS, CAISSONS AND HULL OF MAINE SHOWING DETAIL OF RAISING DEVICE.

lapped timber construction, as shown in the section in Fig. 3, and are to be made extra strong for load transmission, as the thorough cross-bracing will indicate. They are to be made watertight so that they can be pumped dry, to the chamber

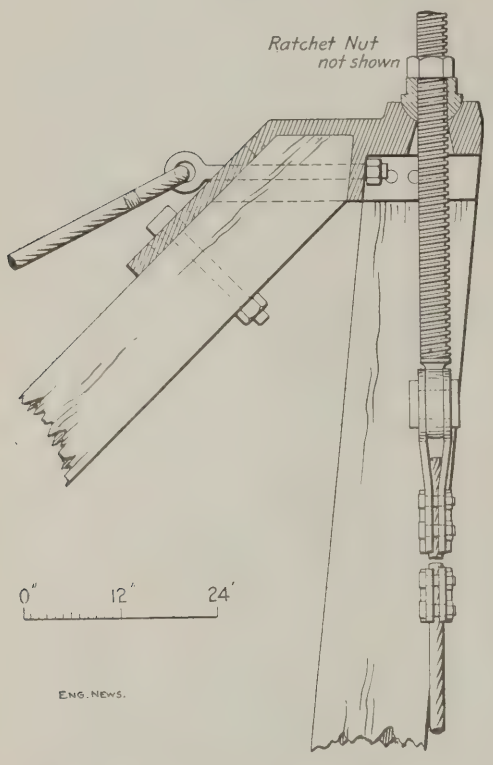


FIG. 4—DETAIL OF CAP AT TOP OF A-FRAME SHOWING SCREW DEVICE.

ceiling, but they are to be filled with water at the beginning of the operation, for reasons explained below. The caissons are built with the outer cutting edge higher than the inside to keep the escaping compressed air away from the vessel, which would otherwise be disturbed and further sunk in the mud. As the bottom of the wreck is about 10 ft. below the present harbor bottom, the caissons will be sunk some 10 ft. farther so as to make certain that their bottoms are well below the lowest part of the sunken frame work. When the caissons are driven to their required depth, the dock is to be continued straight across their tops up to the side of the wreck and is to be used as the working platform, from which to conduct all operations. On the outside face of the caissons toward the wreck there will be hung in vertical lines and spaced about every 4 ft. longitudinally, a number of wire cables stapled lightly to the wooden framing of the caisson and coiled at the upper end on the caisson top, with the lower end passing under the driving edge of the caisson and coiled in the working chamber. On one side, there are to be ¾-in. steel cables, such as are ordinarily used in construction work, and on the other they are to be at least of 2-in. plough steel with an ultimate loading capacity of 400,000 lbs.

We can now imagine the caissons sunk to their proper elevation. At every 4 ft. along the inner face of the left hand set (Fig. 2) is a ¾-in. cable coiled on top of the dock, passing down the side of the caisson, under its cutting edge into the working chamber, where it hangs coiled. On the right-hand set of caissons hang 2-in. cables arranged in the same manner. Now in the opening below the working chamber below the left-hand caisson, a 3-in. wrought iron, inside-coupled pipe is driven out into the mud, which will stand against the air pressure from the chamber, toward the opposite or right-hand caisson. Gradually, section by section this pipe is driven over until it penetrates the working chamber of the opposite caisson. Into this pipe is then led the end of the ¾-in. cable coiled in the left-hand working chamber, as a pilot cable which is to connect the two working chambers. Now, from the right-hand caisson the 3-in. pipe is drawn in, section after section removed and slipped over the connecting cable, until finally the whole pipe is taken in and the two chambers are connected only by cable through the intervening mud.

Now, the end of the ¾-in. cable in the right-hand chamber is spliced to the 2-in. cable hanging there and, by tension applied at the upper end of the ¾-in. cable at the top of the left-hand caisson, the two cables are gradually pulled up toward the bottom of the ship. First the bights around the driving edges are pulled out, then the light staples holding the cables to the caisson faces, and then the cable is pulled through the soft mud up tight against the bottom of the wreck. Pulling is continued until the 2-in. cable appears on the left-hand dock and has thus passed completely under the ship. This process is repeated for each of the cables, spaced every 4 ft., until finally there would be about 60 of these cables passing under the ship, snug up against its bottom and held securely on the solid dock on either side.

There now remains to design some method of tackle whereby these cables may be simultaneously tightened and raised, bringing, as they must if they are raised, the hulk up from the muddy bottom with them. The tackle, as now designed, is shown on the section in Fig. 3 and in detail in Fig. 4. It consists primarily of an A-frame above each of the cables, with the main mast footing on the inside wall of the caisson and with the bracing leg and the guy ropes carrying back to the dock proper. At the top of each frame is a cast iron cap, such as is shown in the detail design in Fig. 4, carrying a pack-screw system, by means of which the lifting is to be done.

The jack-screws are designed to lift more than 100 tons and the bottom end is formed of an eye-bar like that of a bridge truss, while the clamp which grips the cable ends in two similar eye-bars into which the screw is fastened with a 3½-in. steel pin (Fig. 6). This screw passes up through the cast iron cap and is provided with a ratchet-headed nut, by means of which the screw is operated. In order to provide universal motion to care for the necessary movement in the cable and also to prevent the cable from twisting during its raising, a special saddle or head has been designed for the cap. Primarily this consists of an oval cup-shaped indentation in the upper face of the cap into which fits a similarly shaped saddle, provided with a 3-9/16-in. opening, through which the 3½-in. screw passes and provided further with a flat side against which the flattened side of the lifting screw sets. The oval-shaped opening allows universal motion without twisting in a horizontal plane and the

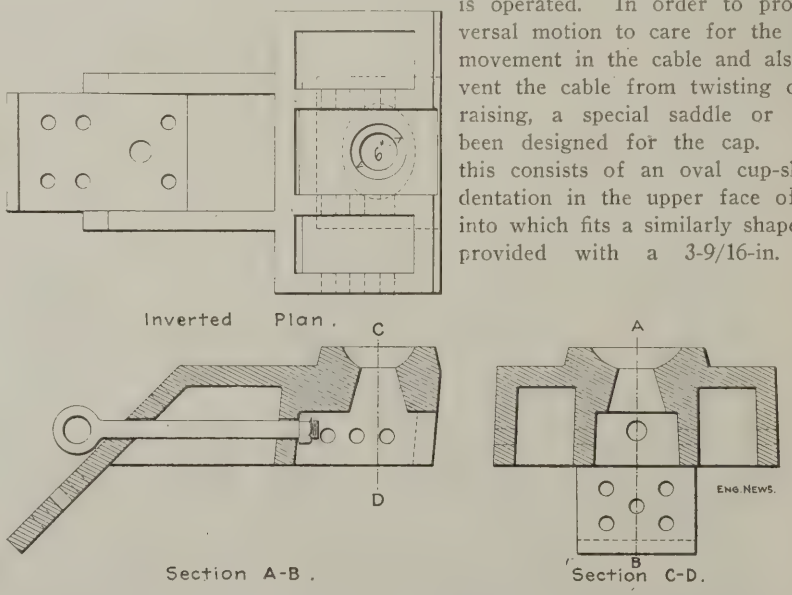


FIG. 5—DETAILS OF UNIVERSAL JOINT CAP.

flattened screw prevents the screw from turning when raising.

The method of raising the wreck has been worked out as follows: As soon as the cables are taut under the ship, but before any weight has been put upon them, the working chambers of the caissons will be filled tight with sand so as to give an even and solid bearing of the caisson on the mud bottom and then the caissons will be pumped down to such a depth that the weight of water removed will nearly equal the weight of the hulk. In this way no weight will be placed on the mud at the bottom of the caissons greater than that on them during their sinking. This water having been removed, pipes carrying compressed air or water under pressure will be forced down along the sides of the hull of the Maine in order to loosen the 12-year hold that the harbor mud has taken on the bottom and side plates of the wreck. This grip having been loosened, the lifting operation can commence.

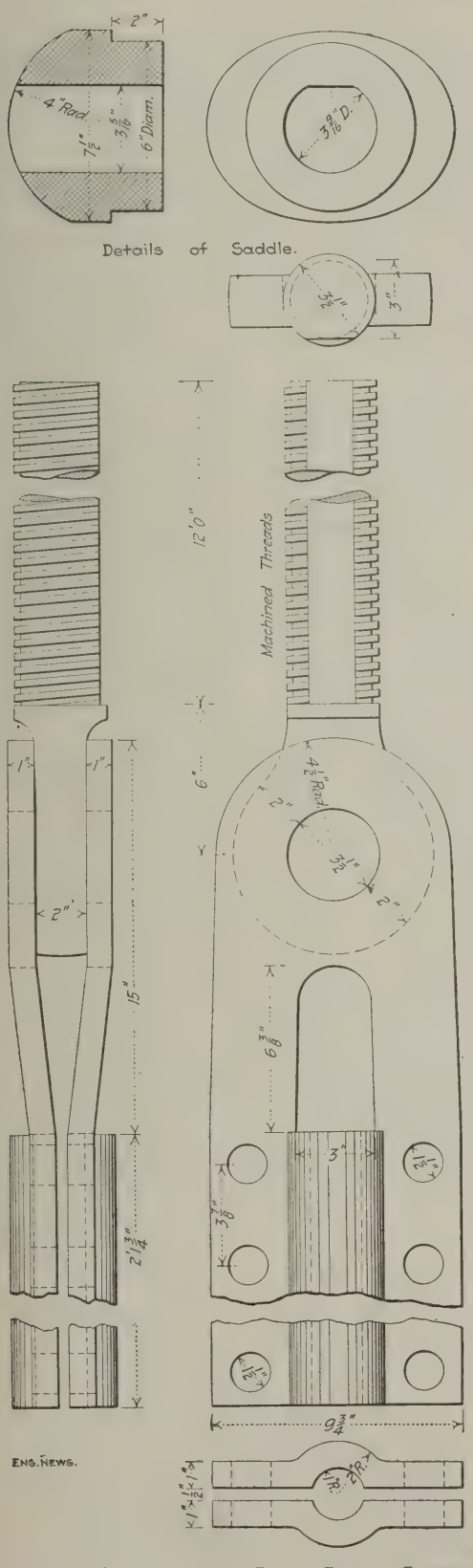


FIG. 6—DETAILS OF CABLE CLAMP, SCREW CONNECTION AND SADDLE ON TOP OF CAP.

First, the screws will be operated locally in such places as to raise the vessel to a horizontal position, both laterally and transversely, for she has settled on one side and down by the head. When this is done, the screws are all at different levels. As there is a large excess of strength in the cables and lifting apparatus, one or more pairs of screws are slacked off and the screws fleeted down their full length and then tensioned as before. This is repeated with all the cables until they are all ready for a full lift. Then the real lifting operation will commence. Mr. O'Rourke plans that about 1,000 men will be needed to man the jacks and suggests that the government detail a regiment of the army for that purpose. At any rate, each jack will be manned by at least eight men and, acting simultaneously on signals, these men will lift each cable through a quarter turn of the head nut, a ratchet head being provided to insure that only a quarter turn can be made at one time. Thus the whole ship may be lifted through the 10-ft. length of the screws and one by one the cables can then be relaxed, the screw dropped and then again taken up and the raising continued.

This possibility of relaxing one screw and cable at a time is one of the main features of the design. It is computed that the cables and their screws are strong enough to bear safely four times the weight of the vessel, so that, if necessary, every other one of the cables could be released at the same time and the vessel could be carried safely on the remaining half. However, it is not intended to leave so many of the cables loose at one time, but the spacing between cables, 4 ft., is quite small enough so that the two next cables, 8 ft. apart, can easily carry the load while the intervening cable is being relaxed and the screw lowered.

Once the vessel has been raised above the water, a platform can be built under her across between the two docks, and held as she is in the cable cradle, the bodies of the men can be removed, the hull examined and repaired and the vessel can be entirely refitted so as to leave Havana under her own steam.

Autogenous Welding Plants on the Pacific Coast

The Standard Boiler Works, Seattle, has recently installed a complete electric welding plant for making repairs on furnaces, boilers and ships. The plant is fitted on a barge which makes it possible for the company to do repair work quickly and at any place. A spur track leading to the company's shops has been put in, which enables them to use the same plant for the repair of locomotives and cars. This is the first electric welding plant on the Pacific coast north of San Francisco, and its success is being carefully noted. The electric welder used by the Standard Boiler Works is the German make using two points, the plus terminal being attached to the welding stick which is used to fill the fracture. Among the work already done with the electric welder are repairs to the boilers in the steamers Sampson and Argo and a number of locomotives, which has been thoroughly satisfactory.

The Commercial Boiler Works, Seattle, has recently added to its boiler shop equipment, a complete oxy-acetylene welding and cutting plant. The equipment includes a stationary plant for use in the shop and a portable plant for use outside. The Commercial Boiler Works is making a number of very extensive tests on the adaptation of this welding process to its boiler repair work, and with the addition of the oxy-acteylene welding plant, is equipped to handle all kinds of boiler building and repair of whatever size.

The Anchor Line has contracted with A. Stephen & Co., Govan, Scotland, for two freight and passenger steamers for the Glasgow, Liverpool and Calcutta trade. These vessels will be 410 ft. long, 53 ft. beam and 32½ ft. deep.

It is announced that at the recent speed trial of the new battleship Delaware an average speed of 21½ knots an hour was maintained for four consecutive hours under forced draft and 19 knots for 24 consecutive hours at normal draft.

A GRAPHICAL METHOD OF POWERING SHIPS

SIDNEY GRAVES KOON, M. M. E.

EVERY new ship is the subject of a computation to determine the horsepower requisite to drive her at the desired speed. These calculations are made in various ways, but the great majority are based on the so-called Admiralty formula, $H = \frac{D^{\frac{2}{3}} V^3}{K}$, where H is the horsepower required for speed V in knots, D is the ship's displacement in tons, and K is the Admiralty co-efficient. It is in the choice of this co-efficient that the judgment of the designer makes itself most apparent. The figure will be higher with fine models than with fuller ones; higher with moderate than with higher (relative) speeds; and very slightly higher with large ships than with smaller ones of the same form.

There is no available substitute for the judgment of the designer; but, in cases where large numbers of designs are under consideration, it is quite possible to construct curves from which the desired result in horsepower may be read off, almost at a glance. The preparation of the curves requires the calculation of a number of separate cases, but, once calculated and carefully plotted, a great saving of time enters into the determination of the horsepower for the next proposed ship. A single set of curves, based on a single assumed value of K, would obviously not fit all cases, but our equation shows us that this co-efficient enters as a direct factor; hence, if our curves are plotted on a basis of K_1, and our designer's judgment places the value for any given ship at K_2, then the result obtained from the curves, multiplied by K_1 and divided by K_2, will produce the required horsepower.

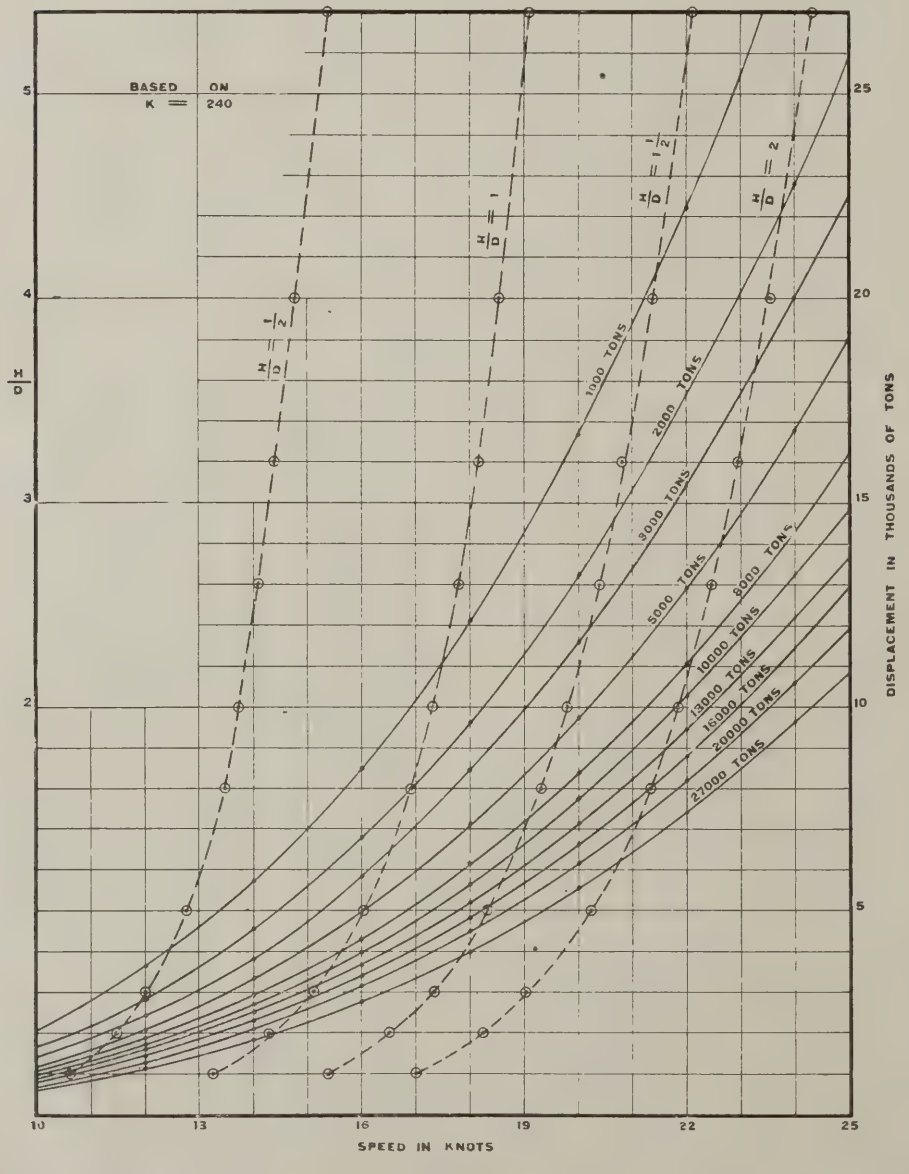


FIG. 1.

Suppose we desire the horsepower required to drive a ship of 13,000 tons displacement at a speed of 20 knots. The Admiralty co-efficient is placed at (say) 240. Then $D^{\frac{2}{3}} = (13{,}000)^{\frac{2}{3}} = 553$; $V^3 = (20)^3 = 8{,}000$; $H = \frac{553 \times 8{,}000}{240} = 18.433$. If, now, we divide H by D, we obtain 1.418 as the units of horsepower per ton of displacement.

By continuing in this manner, we may readily obtain enough information about the powers required to drive such a ship at various speeds, to be able to plot a curve in which values of H/D appear as ordinates, based on values of V as abscissae; and similarly for other displacements. Such curves, for displacements varying from 1,000 to 27,000 tons, all based on K = 240, are shown in Fig. 1. The dotted curves shown are included more as a matter of academic interest than of practical value. Each dotted curve carries a definite value of H/D, such as 1.5, through successive values of V corresponding to variations in D.

Fig. 2 shows another method of plotting the same information as is given by the solid curves of Fig. 1. Here the value of H/D is again the ordinate, but the abscissa is D, while each curve represents a definite and constant value of V, all with K = 240, as before. In some respects this is more convenient for reference than is Fig. 1.

EXAMPLES.

1.—D = 16,000; V = 21; K = 225; H = ? On Fig. 1, the curve for D =

16,000 crosses the line for V = 21 at a value which may be read as 1.55. Therefore, for K = 240, H = 1.55 × 16,000 = 24,800. But K = 225. Therefore H = $24{,}800 \times \frac{240}{225}$ = 26,453, and 26,500 horsepower should furnish the required speed.

2.—D = 9,000; V = 18½; K = 240; H = ? By inspection (between the curves), H/D = 1.27, and H = 11,430. This ship would naturally be provided with engines designed for 11,500 H. P.

Another way of getting at cases which do not fall exactly on the lines plotted depends upon the relative rates of variation of these various elements. Our first equation shows that H varies as the cube of V, and as the two-thirds power of D. In other words, for similar-formed ships, $\frac{H_1}{H_2} = \frac{V_1^3}{V_2^3}$ when D is constant, and $\frac{H_1}{H_2} = \frac{}{D^{\frac{2}{3}}_2}$ when V is constant. When both D and V vary, $\frac{H_1}{H_2} = \frac{V_1^3\ D^{\frac{2}{3}}_1}{V_2^3\ D^{\frac{2}{3}}_2}$, with K constant.

Now, variations in both V and D may be expressed in percentages of the quantities themselves, and their effects on H computed in a very simple manner which, for all practical purposes, is sufficiently exact. If we designate by V% the percentage variation in V, and by D% that in D, we find that

$$\frac{H_1}{H_2} = (1 + 3V\%) \times (1 + 2/3D\%).$$

The simplicity of the practical application of this formula is best shown by another example:

Let D = 8,300; V = 20½; K = 240; H = ?

From the diagram, H = 1.667 D = 13,333, when D = 8,000 and V = 20. Now D% = 3.75 and V% = 2.5; therefore,

Horsepower, first approximation =	13,333
Correction for D% = (3.75 × 2/3)% =	333
Horsepower, second aproximation =	13,666
Correction for V% = (2.5 × 3)% =	1,025
Horsepower, final approximation =	14,691

With K differing from the K of our curves, another approximation would be necessary.

If we compute the horsepower directly, by means of the Admiralty formula, we shall have H = $\frac{410 \times 8{,}615}{240}$ = 14,717.

The difference is negligible, for, as a matter of fact, the engines would in all probability be designed for 14,750 or even 15,000 horsepower.

The construction of a number of sets of curves on a large scale, each set representing a definite value of K, would involve considerable "initial" labor in computation and plotting, but the simplification which would result on subsequent calculations should pay enormous dividends on the investment.

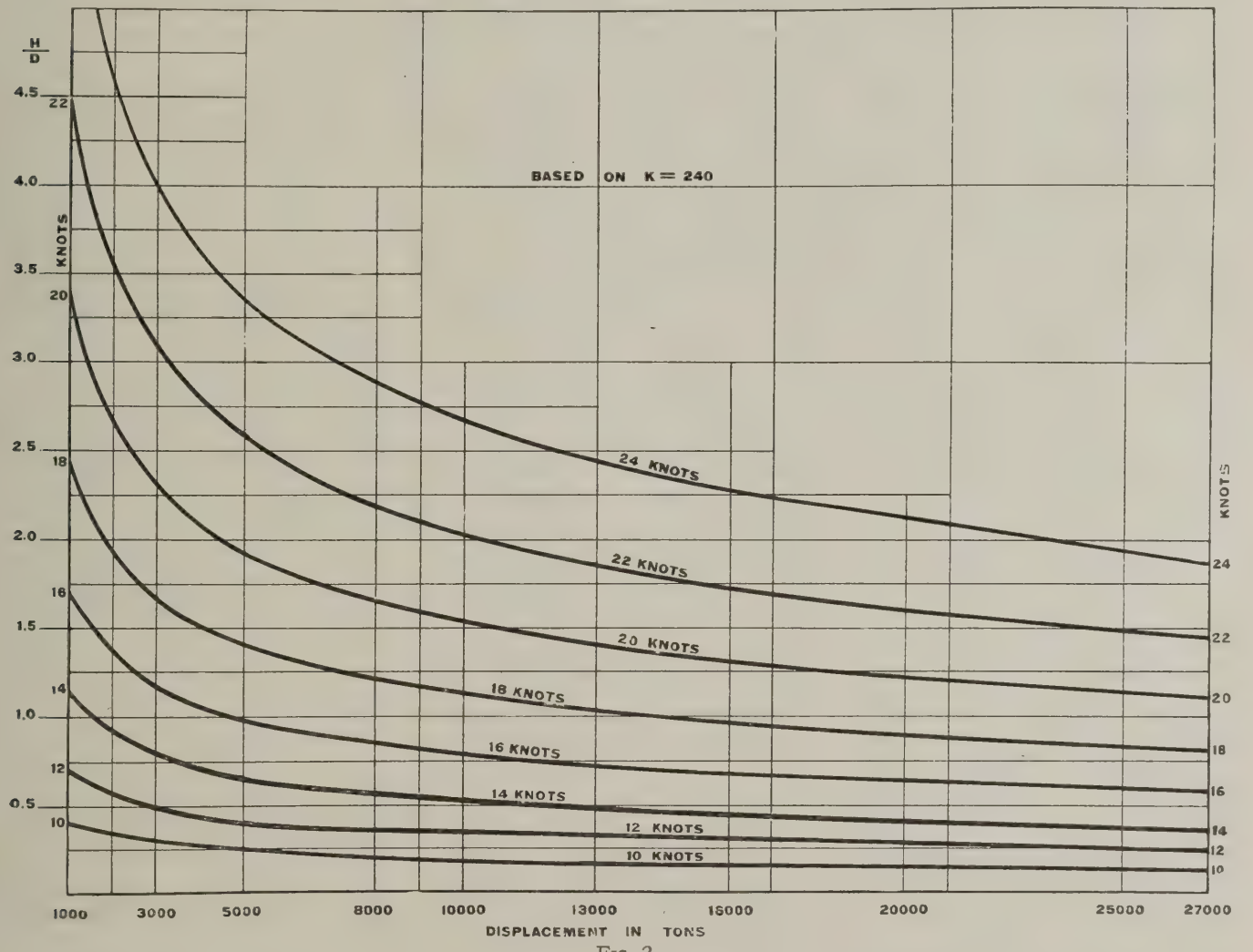


FIG. 2.

The Isthmian Canal Commission has awarded contract to William Simons & Co., Renfrew, Scotland, for a steel seagoing ladder dredge for service at the Pacific entrance of the Panama Canal at $399,340. The other bidders were: Union Iron Works, San Francisco, $874,146, and Lobnitz & Co., Renfrew, $449,000.

THE MARINE REVIEW

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The Navy

In its contention that there should be no navy without a merchant marine, THE MARINE REVIEW is not to be considered as opposed or inimical to our navy, for the contrary is the fact, but as emphasizing the incongruity of having a large and powerful fleet and no ocean-borne commerce for that fleet to defend. As Mahan says,[1] *"The necessity of a navy springs therefore from the existence of a peaceful shipping and disappears with it except in the case of a nation which has aggressive tendencies and keeps up a navy merely as a branch of the military establishment."* Every authority on naval matters makes the existence of a sea-borne commerce the condition precedent to the establishment of an armed fleet.

Napoleon's greatest efforts were put forth to cripple, not England's navy, but her commerce, hence the growth and wonderful efficiency of that navy. Hence with no merchant marine a navy is without justification, and money spent therefor is literally cast into the sea. The REVIEW hopes to bring this astounding, not to say humiliating, condition of affairs home to the people, that they may force their representatives in congress to immediate action which shall prove both effective and lasting as a remedy.

The REVIEW has expressed its opinion as to the management and operation of the fleet and it frankly recognizes the efforts now making to secure economy in certain branches of expenditure on board ship, such as competition in fuel consumption, and the substitution of the general store system afloat for the wasteful and indefensible semi-annual allowance which resulted in filling the store rooms with unused material to be landed at the end of the cruise, reappraised, at heavy loss, or else thrown on the dump as valueless through deterioration. The REVIEW is glad to see an awakening on the part of sea officers to the importance of saving at all points in order that a larger share of the naval appropriation may be available for purposes either of war or of preparation for war and it would be the last to stint the navy in those outlays which are requisite for maintaining a state of readiness that is half the battle. Whether or not our ships are equipped with many things that might well be dispensed with at no sacrifice of actual comfort or of fighting qualities is another question into which it is not necessary to enter at this moment. In general terms the REVIEW respects and honors the men on board our battleships who are so faithfully laboring for efficiency, so anxious to fit themselves and their weapons for any demand the country may impose.

The navy ashore stands in a totally different category. The department at Washington, the various shore stations, navy yards, gun factories, and what not, should exist solely for the upkeep of the fleet. That is so self-evident as to need no demonstration, yet we find, on examination, that these numberless establishments owe their origin and development, in too many cases, to causes with which the fleet has no concern. On no possible ground of public welfare can the reopening the navy yard at Portsmouth, N. H., be justified in view of its proximity (60 miles) to that at Boston; nor the founding of one at Charleston, S. C., where the water approaches forbid the entrance of a deep draught vessel or a wounded man-of-war unduly immersed at bow or stern. A probable explanation may be found in the presence on the Senate naval committee of two powerful politicians from the state mentioned.

One of the ablest writers on naval matters, Admiral Sir Cyprian Bridge, R. N., lays down the rule under this head in unmistakable and timely words:

"The general principle to be followed in the case of dock yards and similar government establishments is to form and keep them on the smallest scale compatible with real requirements. No portion of the naval expenditure of a country should be scrutinized more closely or incurred with greater reluctance than that devoted to their creation and expansion. Where the resources of a country admit of recourse to private industry, the desirability of permitting an overflow of work from the government establishments to the latter should exert unceasing influence upon naval

[1]The Influence of Sea Power Upon History.

policy. This leads up to the statement of another principle. The number of government establishments of the kind in question should be kept as small as possible. What is wanted is, not the most we can get, but the fewest that we can manage to do with. This should be axiomatic."*

In these sentences are all the law and the prophets, yet how atrociously have we violated the former. The present administration cannot be absolved from guilt in this connection, for one of its first acts was to reopen the yards at Pensacola and New Orleans which Secretary Newberry had wisely closed. It is questionable whether there should be more navy yards on the Atlantic coast than three, at New York, Philadelphia and Norfolk; on the Gulf coast one, and on the Pacific coast, two. The latter are badly placed, for the Bremerton yard ought to be at Seattle and the Mare Island yard at San Francisco. How much money might be saved by shutting up the unnecessary yards, by concentrating work in a few, well appointed and economically administered, and by utilizing private plants for the surplusage cannot be accurately estimated, but that the turn would greatly reduce the annual naval appropriation cannot be denied. It would only be fair to the navy afloat to rid it of a reproach under which it now suffers but from which it derives absolutely no benefit. Extravagant as our ships are in cost and maintenance, due chiefly, as the REVIEW has already pointed out, to lack of intelligence and co-operation in design and to totally unnecessary features of equipment and however true it is that the naval appropriations are out of all proportion to the results as embodied in the fleet it is also true that no inconsiderable proportion of these sums goes to maintaining wholly needless shore stations clamoring every year for huge expenditures in "improvements" that are not wanted and in supporting a large administrative staff for doing little work that is of real value to the ships. In this direction lies an almost limitless field for retrenchment and reform. But what will the politicians say to such a proposition?

*The Art of Naval Warfare, p. 51.

Our Trade with South America

Consul-General R. M. Bartleman has made a very significant report to the state department on the growth of Argentina shipping facilities with Europe and, among other things, he says:

During the first five months of 1910, not a single merchant vessel flying the American flag has entered the port of Buenos Aires. We are obliged to ship our products to Argentina under foreign flags. Other shipping interests have improved the opportunity of turning the greater interest of the United States in Latin America to strengthen their fleets and to reap the fruits of what we have sown. It is said that the Lamport & Holt line is to place a new passenger steamer on the New York-Buenos Aires route that will be even finer than its new 12,000-ton Vasari, and, if so, the tribute that American exporters will have to pay to foreigners for carrying their goods will be greater than ever. Why not remember that as a strictly business proposition, this Lamport & Holt service between New York and the east coast of South America has succeeded and can't some United States service do likewise?

A line could succeed on a strictly business proposition, if some of the handicaps under which the American ship operates on the high seas could be removed. To begin with, it costs more to build a ship in the United States than it does abroad, and then it costs more to operate her after she is built—and of these two the latter is the more important. The plane of living in the United States is higher than in any other country. That is admitted by all nations. The tariff is horizontal in its application and has elevated the rewards of nearly every industry within the borders of the United States; but it has stopped short of the ship, and that is what is the matter with the American ship. It has to operate unprotected on the high seas while bearing the unequal burden of higher cost without receiving any compensating advantages whatever. It carries upon the high seas the same plane of living that obtains on land and has to maintain a food scale that is the most abundant among nations. No real American can quarrel with this condition, for it is a part of the creed of the American people that they shall have the best there is to be had. But this superior scale must be met somehow and it can be met only by definite and direct support. The Humphrey ocean mail bill, projecting lines to South American ports, was one of the most sensible and practical measures ever devised to give the American ship a fighting chance to gain South American trade. When the American ship has once established trade routes to South America and American business men have developed trade connections there, the American ship will not have much trouble in holding its own with the ships of other countries that now so completely control South American trade.

It is a surprising thing that unfair conditions have been permitted to continue so long. It has been pointed out over and over again that the great market lying south of us, a part of our own hemisphere, has been almost completely monopolized by foreigners. It is a shameful thing that not a single American merchant vessel has visited the port of Buenos Aires so far as reported this year. The policy that permits such a thing to happen is certainly a short-sighted one. How can we expect to develop trade with the South American countries unless we are self-contained as to the means of reaching them? We are permitting the nations of Europe to dominate absolutely the trade of the South American countries to their great pecuniary profit. Unless our fiscal policy is promptly changed there will not be a single American ship to pass through the Panama canal when it is completed. This great ditch will have been dug for foreign ships. It ought to open a convenient roadway from the work shops of the Atlantic coast to the consuming populations of the west coast of South America, but what it will actually be will be a route from Europe to them.

Attention has been called to this vital defect on numerous occasions. It was one of the points most forcefully emphasized by Secretary Root when he returned from his tour of the South American countries a few years ago and which caused him to make a most earnest appeal for government aid for the American ships. If our for-

eign shipping operates under the artificial handicap imposed upon it by the tariff it should be artificially removed.

A little while ago, Mr. Stewart, second assistant postmaster general, complained about the inadequacy of mail facilities to South America. All of our mail is carried to South American cities in foreign ships over which the postoffice department has absolutely no control. There is no regularity in sailings. Schedules are subject to change without notice, resulting in a frightful impediment to business. It seems absolutely ridiculous that a nation of 90,000,000 of people should suffer such a condition to continue. Our prosperity depends upon getting rid of our surplus products. The only way to get rid of them is to export them, and why on earth we permit foreign nations to absorb one of the richest fields, lying practically at our door, is one of the things that is impossible to understand. It is certainly folly.

Prize Problems of Great Lakes Engineering Works

The Great Lakes Engineering Works exhibited at the Detroit Industrial Exposition a model of the bulk freighter, William P. Palmer, building on the Isherwood system of construction for the Pittsburg Steamship Co. The company offered three prizes to the school children of Detroit for correct answers to six problems based upon the following particulars:

The dimensions of the steel bulk freight steamer, William P. Palmer, are as follows: Length over all, 607 ft.; length on keel, 580 ft.; beam, moulded, 58 ft.; depth, moulded, 32 ft.; height from keel to top of pilot house, 63 ft. 3 in.

The total weight of materials entering into the construction of this steamer is 9,886,000 lbs.; materials consisting of steel, iron, brass, copper, etc.

The total number of steel rivets required in the construction of this steamer is 700,000. The number of punched holes in the hull of the steamer is 1,750,000; this number being necessary for the number of rivets mentioned.

When floating light without any cargo, she displaces 4,943 short tons; when loaded to her limiting draught of 19 ft., she displaces 17,555 short tons.

The internal capacity of the ship, acceptable for the storage of cargo, is 496,800 cu. ft. A difference of 80 tons of cargo makes a difference of 1 in. in the draught when the vessel is floating at the load draught.

The problems, correctly answered, were as follows:

Problem No. 1.—What weight of iron ore can she carry on a draught of 19 ft.?

Answer:—Number of short tons, 12,612.

Problem No. 2.—When filled completely with a cargo of coal, which occupies 40 cu. ft. to the ton, what weight of coal can she carry? Will her draught be 19 ft.? If not, what will it be?

Answer:—She will carry 12,420 short tons. Her draught will be 18 ft. 9.6 in.

Problem No. 3.—When filled completely with wheat, weighing 60 lbs. per bu., how many bushels of wheat can she carry? Will her draught be 19 ft., and if not, what will it be?

Answer:—She will carry 399,214.3 bu. Her draught will be 18 ft. 4.1 in.

Problem No. 4.—Supposing a farm produces 25 bu. to the acre, what size farm is it necessary to fill the ship for one voyage?

Answer:—A farm of 15,968.5 acres.

Problem No. 5.—If one cu. ft. of iron ore weighs 140 lbs., what percentage of the total cargo space does the iron ore occupy when ship is loaded to 19 ft. draught?

Answer:—The iron ore occupies 36.2 per cent.

Problem No. 6.—If the engines of the ship are 2,000 h. p., and the speed is 11½ miles per hour, and length of the voyage 1,000 miles, and it requires 1.6 lbs. of coal for every h. p. per hour, what will be the cost of the coal for the voyage if the price of same delivered in the coal bunkers of the ship is $3.00 per net ton?

Answer:—Coal for one voyage will cost $417.39.

The winner of the first prize, amounting to $50.00, was Grace Cantelo, Farrand school, age 13 years; second prize, $25.00, W. W. Raymond, Central High, age 16 years; third prize, $15.00. Prescilla Dillaway, Central High, 16 years old.

The judges were: Prof. H. C. Sadler, Prof. M. E. Cooley and Sidney R. Russel.

John A. Donaldson's Promotion

John. A. Donaldson, of the Pittsburg Coal Co., was, on Aug. 11, appointed president of the Monongahela River Consolidated Coal & Coke Co., with headquarters at Pittsburg.

James H. Wood, district sales agent for the Pittsburg Coal Co., was promoted to Mr. Donaldson's old position as manager of lake shipping and fuel department of the Pittsburg Coal Co. Mr. Donaldson left immediately for Pittsburg. He had been connected with the lake coal trade for about 17 years, and was probably the most popular man in the business on the lakes. He came to Cleveland as the representative of the Pittsburg & Chicago Coal Co., but when the Pittsburg Coal Co. was organized, taking over a number of firms, he went with it as general agent. In 1902 he organized the National Fuel & Dock Co., which was later sold to the Pittsburg Coal Co.

The Monongahela River Consolidated Coal & Coke Co. is one of the largest producers of coal in the Pittsburg district, operating a large fleet of steamers and barges and having 42 producing mines. Its annual output of coal is about 8,000,000 tons, of which amount about 1,500,000 tons comes to the lakes.

Captains Suspended

Local Inspectors Stewart and Van Liew, at Port Huron, who investigated the circumstances surrounding the collision between the steamers James B. Wood and Frank H. Goodyear, whereby the Goodyear was sunk with a loss of 18 lives in Lake Huron, on May 23, have found both vessels equally guilty in that they were running at full speed during a heavy fog. The license of Capt. T. D. Gibson, of the steamer Wood, was revoked. Capt. R. F. Hemenger, of the steamer Goodyear, was suspended for 60 days, and Donald McLachlan, mate of the Wood, was suspended for 30 days. The finding is that Capt. Hemenger, of the Goodyear, violated Rule 15, which requires that vessels shall go at moderate speed during a fog. Donald McLachlan, of the Wood, was also found guilty of violating Rule 15. Capt. Gibson, of the Wood, is held to have violated Rule 2. The inspectors hold that if either rules had been observed the collision could not have occurred.

Unloading Record

A record was made by the four 15-ton Hulett electric machines at Ashtabula on Aug. 5 in unloading 11,131 gross tons of ore from the steamer Thomas F. Cole in four hours 30 minutes, net time, at the rate of 630.6 gross tons per machine per hour. The Cole arrived at Ashtabula at 10:53 a. m., and left at 5 p. m., making the total time at dock six hours and seven minutes, which included one hour for dinner. All the ore was unloaded direct into cars with no damage to the vessel. The machines handled 598.2 gross tons to 671.4 tons per hour, making the average 630.6 tons per hour for each machine.

LAUNCHING THE BULK FREIGHTER WILLIAM B. DICKSON AT THE ECORSE YARD OF THE GREAT LAKES ENGINEERING WORKS.

THE bulk freighter William B. Dickson, building for the Pittsburgh Steamship Co., was launched from the Ecorse yard of the Great Lakes Engineering Works on Saturday, Aug. 27. She was named in honor of the first vice-president of the United States Steel Corporation and was christened by his daughter, Miss Emma Young Dickson, of New York.

This is the second of three freighters under way at this yard for the Pittsburgh Steamship Co. to be launched. The W. J. Olcott was launched some time ago and the William P. Palmer will be launched in a few weeks. Quite an event was made out of the launching, the Great Lakes Engineering Works chartering the steamer Pleasure to take the launching party to the ship yard. About 300 persons saw the vessel go overboard, and as is usual at lake yards, the launching was successful in every way. The launching party was subsequently entertained at luncheon at the Detroit club and with an automobile trip throughout the parks, though this latter feature had to be somewhat curtailed, owing to the necessity of Mr. Dickson's return to New York the latter part of the afternoon.

Harry Coulby, president and general manager of the Pittsburgh Steamship Co., acted as toastmaster at the luncheon. After proposing a toast to the sponsor he introduced Mr. Dickson, who spoke briefly upon industrial affairs. He admitted a lull in trade but regarded it as only temporary. Mr. Coulby then introduced Antonio C. Pessano, president and general manager of the Great Lakes Engineering Works, who expressed his pleasure at the optimistic views of Mr. Dickson and thought the country could not do other than go ahead. "Its progress must," he said, "continue to be onward and upward."

President William Livingstone, of the Lake Carriers' Association, upon being introduced gave a few illuminating facts regarding lake commerce, saying that for every minute of the twenty-four hours of the day, 228 tons of freight pass over the Limekiln crossing. He was confident that the great strides of the past would be more than equalled in the future.

John P. Whelan, the collector of the port, also spoke briefly. In the launching party were: Mr. and Mrs. Wm. B. Dickson, Misses Emma, Susie and Eleanor Dickson, W. B. Taylor and Miss Stella Taylor, of New York; H. G. Dalton, E. C. Collins, Cept. John Mitchell, John Scott, F. B. Smith, L. Hausheer, of Cleveland; Antonio C. Pessano, H. W. Hoyt, William Livingstone and Mr. and Mrs. John B. Whalen, of Detroit.

THE DICKSON LAUNCHING PARTY ON THE LAUNCHING STAND.

The Dickson is 600 ft. over all, 580 ft. between perpendiculars, 58 ft. beam and 30 ft. deep.

She will carry about 12,000 tons of ore on favorable draught. She will come out in about a fortnight and will be commanded by Capt. A. P. Chambers.

Isherwood Rights for the Great Lakes

PRESIDENT James C. Wallace, of the American Ship Building Co., announced upon his return from England, on Aug. 20, that he had closed a deal on behalf of the American Ship Building Co., for the rights to the Isherwood or longitudinal system of construction of vessels on the great lakes. The company will during the winter construct at its Lorain yard a 10,000-ton steamer upon this system, to be ready at the opening of navigation next spring. There is one steamer now building on the great lakes under this system, the William P. Palmer, at the Ecorse yard of the Great Lakes Engineering Works. While she will be launched this fall, she will not go into commission until next spring.

Before the Pittsburg Steamship Co. definitely concluded to build the Palmer upon this system J. W. Isherwood, the designer, and C. Buchanan, Lloyds assistant chief ship surveyor, and James H. Mancor, Lloyds chief surveyor for the United States, spent several weeks on the lakes.

Mr. Wallace's announcement that the American Ship Building Co. has become the licensed agents for this system of construction on the great lakes is of far-reaching importance. It is not to be understood, however, that the other shipyards on the lakes may not build vessels upon this system. They can do so by paying royalty to the American Ship Building Co. Mr. Wallace stated that the American Ship Building Co. had no disposition to monopolize the rights of this form of construction on the lakes, but had, as a simple business proposition, become its licensed agents for the great lakes. Mr. Wallace has apparently returned from England a thorough believer in the system. He found the English builders, notably Sir W. G. Armstrong, Whitworth & Co., and J. L. Thompson & Sons of Sunderland enthusiastic about the type.

The chief advantage of this system for the lakes, according to Mr. Wallace, lies in the fact that it allows a better distribution of metal than is possible under the transverse system, making a lighter and stronger ship. He thinks there is no question whatever that it will eventually supersede the transverse type on the lakes, and thought it prudent, therefore, to secure the Isherwood rights for the Great Lakes promptly. He estimates the type to save 10 per cent of the hull or launching weight and would therefore have that much greater carrying capacity. The Palmer, now building at Ecorse, will have 384 tons less steel in her than the Dickson, just launched. In other words, she will carry 384 more tons of ore. This would mean that during a full season such a ship would carry an extra load, provided, of course, she carried a full cargo each trip.

There are fifty-two steamers either built or building under the Isherwood system. Sir W. G. Armstrong, Whitworth & Co. are now building three for the Dominion Iron & Steel Co. Blom & Voss of Hamburg are also building some. The Newport News Ship Building & Dry Dock Co., and the Maryland Steel Co. also have orders for vessels upon this system.

The Isherwood system was described in THE MARINE REVIEW, June 4, 1908. Briefly, the closely spaced transverse ribs are omitted and the transverse strength is obtained by fitting on the shell and deck plating a series of strong transverses at widely spaced intervals. These transverses extend completely around the sides, bottom and deck of the ship and are slotted to allow of longitudinal frames and beams being fitted continuously throughout the transverses.

No topic among vessel owners, ship builders and naval architects has been more widely discussed along the lakes during the past fortnight than this one and the general opinion is that Mr. Wallace has made a very shrewd move, though architects are, by no means, a unit as to the advantages of the type for the lakes.

Car Ferry Launched

The car ferry, Marquette & Bessemer No. 2, was launched from the Cleveland yard of the American Ship Building Co., on Sept. 3, being christened by Miss Loiz E. Scott, daughter of John R. Scott, of the Carnegie Steel Co. The car ferry is building for the Marquette & Bessemer Dock & Navigation Co. and will be operated between Conneaut and Port Dover. She is 350 ft. long, 56 ft. beam and 19½ ft. deep, having capacity for 30 freight cars. She has two triple-expansion engines, cylinders 19, 35 and 52 in. diameter by 40-in. stroke, supplied with steam from four Scotch boilers, 13 ft. 9 in. diameter and 12 ft. long. The launching party were given a luncheon at the Union Club by the ship building company. This concludes the program of launchings by this company for the present year.

A. A. Schantz

On Saturday, Aug. 13, A. A. Schantz, general manager of the Detroit & Cleveland Navigation Co., celebrated the thirtieth anniversary of his connection with the line. In his honor a dinner

MR. A. A. SCHANTZ.

was given, at which there were 13 guests and 13 courses. During the 30 years with which Mr. Schantz has been associated with this company, many changes have taken place; the company has grown from a small one to a great one, and much of the credit is due to Mr. Schantz. He has exemplified the biblical injunction to do with all his might whatever his hand findeth to do. His career is a marked example of the success that comes from pitching into

things. It never made much difference to Mr. Schantz what his job was, he was always willing to do whatever was to be done—whether it was hustling baggage, selling tickets, writing folders, it was all in the day's work for him. Mr. Schantz doubtless had an inherent liking as a youngster for the transportation business. When he was a boy in Mansfield, he ran an excursion to Dayton on his own responsibility, hiring the train and billing the town and actually clearing a few dollars. A trip up the lakes determined him as to his life work. He applied for the position of local agent of the Detroit & Cleveland Line at Detroit and got it, passing successively to the positions of traveling passenger agent, general western traveling agent, assistant general passenger agent, general passenger agent and general superintendent and passenger traffic manager. In 1902, he was made a member of the board of directors, and in 1907 general manager.

Repairs to Zenith City

Repairs on the steamer Zenith City, which went on the rocks off Point Au Sable, Lake Superior, on July 28, were completed at the yard of the Toledo Ship Building Co. on Aug. 24. While the boat was in dry dock 57 plates from 14 ft. to 28 ft. in length were removed, 17 new plates were put on, six plates were faired in, 131 channel floors were cut out and the majority replaced with new channels, including connections. The work was completed in 17½ days actual time in dry dock. The steamer was docked on Thursday, Aug. 4, and was out of dock Aug. 24. The Pittsburg Steamship Co. complimented the Toledo Ship Building Co. upon the expedition displayed in this work.

Lake Trade

The season of 1910 will end very quietly on the great lakes. The Pittsburg Steamship Co. has notified the owners of its chartered tonnage that it will be through with the ships on Oct. 15. This will release a fleet having capacity to move about 15,000,000 tons in a full season. There will be little for these ships to do for the balance of the season, as a considerable fleet has already been laid up. The Pittsburg Steamship Co. will retire its own ships on Nov. 15, so that the season on the great lakes will have ended well before Nov. 30. There will be a gradual closing down during November, and many vessels will go into winter quarters earlier than usual. Of course, this program means that not as much ore will be forwarded during the fall months as was expected. In fact, it is not likely that as much will be forwarded from Sept. 1 to the close of navigation as was moved during that period last year. However, the movement for the full season will be safely in excess of that for 1909.

The fleet moved during August 6,964,381 tons, which is 19,092 tons more than were moved during July, notwithstanding the fact that some of the vessels carried their August requirements during July. The movement to Sept. 1 totals 28,827,029 gross tons, an increase of 6,238,480 tons over the movement of 1909. After Sept. 1 last year the fleet moved 19,095,531 tons. Should this record be maintained for the balance of the season the fleet will have moved 47,000,000 tons, but it is not expected that much more than 15,000,000 tons will be moved from Sept. 1 to the close this year, making the total movement for the season between 44,000,000 and 45,000,000 tons. The summary of shipments by ports during August is as follows:

Port.	August, 1909.	August, 1910.
Escanaba	1,037,341	697,412
Marquette	542,607	525,898
Ashland	639,581	645,107
Superior	1,110,213	1,332,284
Duluth	2,279,242	2,382,156
Two Harbors	1,584,215	1,381,524
	7,193,199	6,964,381
1910 decrease		228,818

Port.	To Sept. 1, 1909.	To Sept. 1, 1910.
Escanaba	3,053,845	3,162,271
Marquette	1,413,568	2,249,774
Ashland	1,700,769	2,878,971
Superior	3,686,323	5,227,687
Duluth	7,713,377	9,823,644
Two Harbors	5,020,667	5,484,682
	22,588,549	28,827,029
1910 increase		6,238,480

Vessel owners are relieved that the underwriters have reached an agreement not to charge excess insurance for winter mooring in the outer harbor at Buffalo. Vessels will be moored under the supervision of underwriters about 200 ft. apart, bows to the breakwater, with two anchors and plenty of chain out.

Alex. Johnston, deputy minister of marine and fisheries, Ottawa, opened bids on Sept. 1 for the construction of a twin screw steel lighthouse and buoy steamer to be delivered at Victoria, B. C. The steamer will be 200 ft. long, 38 ft. beam and 17 ft. 6 in. deep.

Port of Portland Harbor

Some interesting facts are available on the work of the bar pilots of the Port of Portland. Portland probably has done more to improve its harbor than any other city of its size in the United States. The Port of Portland (fully described in THE MARINE REVIEW, May, 1909, took over the bar pilotage and river towing about a year ago. There are a number of independent pilots who compete with the commission tugs. The situation at the mouth of the river is such that the independent marine guides can compete with the Port of Portland solely in the steamer trade. Sailing vessels must be given towage and the Port of Portland has tugs and other facilities for that work which the independents lack.

To secure business the independent pilots have, in several instances, traveled to San Francisco, Puget Sound, and British Columbia, which increased their disbursements. On the other hand, they have no equipment to maintain, which is in one way an advantage but a handicap in another, because it precludes them from regularly meeting vessels off the river when no previous arrangement has been made to meet them at a coast harbor. In some cases the independents have brought steamers into the river and the commission pilots brought them into the harbor, but any moves necessary in port were performed by the river pilots, assisted by the tow boats of the Port of Portland, and often the commission's pilots guided the craft over the bar on their return to sea. In either event, the commission reaped a small revenue from the harbor moves, which average $25 each.

There is no competition with the steamers of the Portland & Asiatic Steamship Co., because the Port of Portland secures that revenue on a provision of the tariff through which a reduction of 25 per cent is allowed when 12 or more steamers are operated out of the river each year. Any other line is privileged to take advantage of the same concession. The independent pilots handled 23 vessels during the year, totaling $5,112.52 for pilotage. The fleet secured by the Port of Portland numbered 32 vessels and the pilotage totaled $6,941.06. A number of ships have crossed the bar at the mouth of the Columbia without a pilot other than her master. The Port of Portland has given instruction to rush work on the pilot schooner Joseph Pulitzer and the bar tug Wallula at the Willamette Iron & Steel Works.

Pilotage rates were cut in half at the last meeting of the Port of Portland commission. The old tariff was $5 on each foot of a vessel's draught, and 2 cents per ton on her net register tonnage. The new rate is $2.50 per foot and 1 cent per ton. The reduction was made to drive the independent pilots out of business.

REASONS FOR A CANAL FROM LAKE ERIE TO LAKE MICHIGAN

P. C. RANDALL, in the *Industrial Magazine.**

MY ATTENTION has has been called to an extended account of a speech made by Howard I. Shepherd as president of the Chamber of Commerce, of Toledo, on the question of inland waterways, and also to your editorial comment commending the same. As I have been an ardent advocate of the Michigan and Erie canal and have twice advocated it in public speeches in your city, I want to take issue with Mr. Shepherd on the subject of the practicability of this canal and with the subject of inland waterways in general.

Mr. Shepherd says that large vessels could not go through the Michigan and Erie canal at a speed of more than four miles an hour, and that lake vessels could make the distance from Chicago to Toledo by lake quicker than they could by the canal. I grant this is true. No one advocates the Michigan and Erie canal as a ship canal. It is foolish to talk of this canal and of the Miami and Erie canals as ship canals. These canals, and in fact the whole system of inland waterways, for that matter, must be for barges and not for ships. There is no draw-back to this, as there is no shipping in the world so cheap as that by barges and barge fleets. This has been demonstrated on the canals and canalized rivers in France and Germany. In the first place, the cost of the vessels is much cheaper and the cost of propulsion much less. The average cost of carrying a ton on the Ohio river, including the return of the empty barges, is but one-third of a mill per ton mile, and I am told that the cost in Germany on the larger streams is no more. The distance from Chicago to New York harbor by the Michigan and Erie canal, Lake Erie and the Erie canal is a little over 1,000 miles. Over half of this distance is in the state of New York, as by the Erie canal and the Hudson river it is 520 miles from Buffalo to New York. This, one-half the distance from Chicago to New York, will be for barges and not for ships, and would seem to determine the kind of vessels that should be used between Buffalo and Chicago. If barges are to be used for the entire distance, then why make the great detour of the lakes and travel between 800 and 900 miles farther on each round trip than is necessary? Granted that no time would be saved in going through the canal and that lake vessels could make the longer distance in as short or shorter time, still the fact remains that these vessels would travel on the round trip from 800 to 900 miles farther than necessary, and would in so doing use just that much more coal than needed. Vessels carrying grain from Chicago to New York must stop at the toll-gate at Buffalo. Here their cargoes must be unloaded and loaded again into barges or into cars. If lake vessels only are to be used in carrying freight from Chicago to Buffalo, then barges from western waterways must go through the same process of unloading and loading again at Chicago.

*The canal would probably enter Erie at Toledo, and Michigan at some river near the state line.

Only For Barges.

I do not wonder that Mr. Shepherd is a bear on inland waterways if he conceives that they must be used for ships. If the country goes to inland waterways, and it will, these waterways will all be for barges. It would be utterly impracticable to furnish bridges for cross-country travel that would let ships with their great smoke stacks and great hulks pass through. The Erie canal will always be a barge canal for this reason, no matter how deep and how wide it may be made. No matter how much Mr. Shepherd may deprecate it, the Mississippi and Missouri rivers will be canalized and not only the rivers themselves, but their tributaries likewise. The people of the middle west have been damned by the long railroad haul for all the years past and they are determined to have cheaper transportation both in and out. The country has suffered too much in the past to remain longer quiescent. The recent arbitrary raising of rates by the railroads and changing of schedules have set the people's teeth on edge again and their wrath is renewed.

The railroads have done what they could in the past and they will in the future, to destroy water navigation. They own nearly all the dockage in Buffalo and Chicago and practically dictate what freight shall go by water and what by rail. What they have done in these places they are fast doing in every other water port in the country. They have made the rates so low where there was water competition on the navigable rivers, that they killed the water traffic there. This is noticeably so along the Mississippi and Columbia rivers. When once they have stifled water navigation, back go the rates. Back they go, but always the railroad's rates are lower to river points than to inland points. Although there is very little navigation on the Mississippi, the freight rates to river cities are from $2 to $5 per ton less than to inland cities the same distance from the point of shipment. The same is true to cities on the Great Lakes. Chicago has a differential billing rate east to the Atlantic, 33-1/3 per cent lower than Indiana, Ohio and Michigan cities, hundreds of miles nearer the coast. The rate on wheat from Chicago to New York is 7½ cents per bushel by rail or water, while from cities in Indiana and Ohio the rate is 10½ cents per bushel. Freight that pays 11 cents per 100 at Chicago, pays 17 cents per 100 from Indiana points, not 50 miles distant from Chicago.

Water Only Competition.

I mention this to show the attitude of the railroads toward water navigation and also to show that the people the country over have no hope for competition except that furnished by water. Is there any reason then why the people are clamoring for inland waterways?

Should the traffic system of the country and the manufacturing of the country be both without competition, there would be no hope for the people, except what little they might get from their trust in God. The transportation business of the country is not wholly outside of competition except where there are waterways. With legal agreements and gentleman agreements, the railroads perform the trick and levy the taxes.

James J. Hill said a few days ago, in speaking about government suits against the railroads to restrain them from raising their rates on the western roads: "The tariffs which the western roads have in force are the same as charged by all other roads. They are uniform. Everybody knows that. I do not think there are any anti-trust laws that will prevent the roads from acting as they did. Surely not; laws do not touch them. We all know it. Their rates

are so uniform that they are oppressively monotonous."

Every year, hundreds of millions of water in the shape of stocks and bonds is injected into the already diluted railroad issues with no reason for the addition except to swell fortunes already too much swollen and to give occasion for the further raising of rates.

Either the country must go to inland waterways to furnish competition in transportation or the government must own the railroads or must devise some plan of control. Government ownership of railroads is unthinkable. Government control seems impossible.

Freight Savings.

The people would save every year in lowered freight rates the entire cost of building all the inland waterways in the country. This is true, though these waterways did no more shipping than is now done on the Mississippi river. Ninety per cent of all the trunk line railroads of the nation cross Indiana. Should the Michigan and Erie canal be constructed to a 14-ft. canal at a cost of $50,000,000 and should $25,000,000 be expended in the enlargement of the Miami and Erie canal, a saving in freight quadrupling these two sums would be saved every year. The trunk line railroads crossing Indiana carry 150,000,000 tons of heavy and bulky freight annually. A saving of $2 per ton on this would be $300,000,000. This would be the result if these waterways were no busier than are the other navigable rivers of the country. The saving to the people, however, brought about by these canals, will be much greater, because they will be very busy waterways.

It is objected that the railroads cannot stand this lowering of rates and this competition. No one should lose sleep on this account. Railroads will always do the passenger, the express, the mail and the merchandise business. Germany owns her own railroads, and yet she finds it profitable, not only to her railroads, but to her people as well, to canalize every stream and build canals wherever possible. In this country, where corporations own the railroads, it is necessary for the people to have some means of curbing their power. There is no way except through competition. Give the people highways free from corporate control and they need no longer fear the grip of the railroads at their throat.

There is no doubt about the temper of the people on this question. They are determined to have inland waterways, and they will get them. These waterways will form a net work all over this country. Every river and stream possible will be canalized and canals will be built wherever possible. This vast net work of inland waterways will all be for barges. When this time comes, trunk line barge canals leading to the sea will be needed.

There are but two trunk line inland barge waterways possible from the middle west to salt water within the borders of our own land; the one by the Mississippi river to the Gulf of Mexico; the other through the Mohawk Valley to the Atlantic. By the one it is 1,625 miles to the jetties in the Gulf of Mexico, and by it 3,500 miles by water from Chicago to New York; by the other it is only 1,000 miles from Chicago to New York. The ultimate markets of the middle west are east, not south, and so they will continue to be. Into this trunk line barge canal leading to the east, all the inland barge canals of the middle west will come with products from the west, the southwest and the great northwest, to float out to the sea. It will furnish the cheapest transportation that can possibly be had. Wheat will be carried by this trunk line barge canal from Chicago to New York for less than 1 cent a bushel. When the Erie canal is completed for large barges, the lowest possible cost for taking a bushel of wheat from Chicago to New York by the great lakes and the Erie canal will be twice that sum. The cost for a bushel fo wheat from Chicago to Buffalo by the lakes is 1¼ cent per bushel. To this must be added the toll at Buffalo for unloading and loading, and the transportation 520 miles through the Erie canal.

Promises Heavy Traffic.

In the future economy of transportation, no waterway will be of greater importance to the nation than will the Michigan and Erie canal. The great trunk line barge canal, leading from the middle west to the Atlantic, of which the Michigan and Erie will be an indispensable part, will be the busiest waterway in the world. There are 10,000 vessels of all kinds on the River Rhine, and it is today the busiest waterway in the world. When our inland waterways are made, the busiest waterway will be in this country.

Unless this canal is made, the transportation of our great lakes destined for export will go through the Canadian waters, not through ours. The Welland canal is to be enlarged and the Georgian Bay canal will be constructed. Our great lakes will be the feeders for these Canadian canals. If we would save our own commerce for ourselves, we must build inland waterways, but more especially must we construct the trunk line barge canals.

Our petty jealousies and the present seeming advantages of one locality over the other must give way to a broader view that takes in the whole people, those inland as well as those on the big waters. Those engaged in business that has to do with present transportation conditions should note the changes that are sure to come and unselfishly welcome the greatest good for all.

White Star Liners Olympic and Titanic

The work on the Olympic is now so well advanced that not only is it possible to appreciate the graceful lines of the hull, but also to observe in the development of the internal work of the vessel that interesting transition from the plans to the actual structure that is at once the delight and the reward of the constructor. All the hydraulic riveting is now completed, and various portions of the superstructure are in evidence. While the steel workers have yet much to do, they have made such progress that the woodworkers and others are to get ahead with their work in every direction, and the erection of the staterooms on the various decks is proceeding rapidly, as also is the fitters' and plumbers' work throughout the ship. The work on the Titanic is also proceeding very rapidly, and relative progress has been made with the construction of the machinery for both vessels.

A vessel with a rudder weighing 100 tons, beams 92 ft. long, and steel plates 36 ft. long, may be naturally expected to afford some interesting details with regard to the machinery, and it may be mentioned that each engine crank shaft weighs 118 tons; bed plate, 195 tons; each column, 21 tons; and the heaviest cylinder with liner, 50 tons; wing propeller, 38 tons—these being finished weights. The castings for the turbine cylinder weighed 163 tons, and for the propeller, which is of solid bronze, 22 tons.

Linnard Retires

Naval Constructor J. H. Linnard, for years senior officer in the bureau of construction and repair, United States navy, was placed on the retired list, Aug. 18, at his own request. He entered the naval service in 1877.

The following gem is from a London evening paper, of Aug. 12, in connection with the Terra Nova: "She was drawing a little water when she left Cardiff, but, as any sailor knows, a day or two at sea would swell her timbers and cure the leak."

Thermit Repair to Sternpost

One of the quickest thermit marine repairs in late years was the recent welding of a broken sternpost of the steamer Moses Taylor, of Cleveland. The steamer was placed in drydock at Cleveland on the afternoon of Friday, Aug. 19, and the weld was completed on Wednesday, Aug. 24, it being necessary to ship all materials from New York.

The fracture was caused by the steamer striking some obstruction in shoal water and breaking off the shoe close to the stern post, as shown in the engraving. The broken section was afterwards recovered by divers so that in executing the repair it was only necessary to line it up in its original position and make the weld.

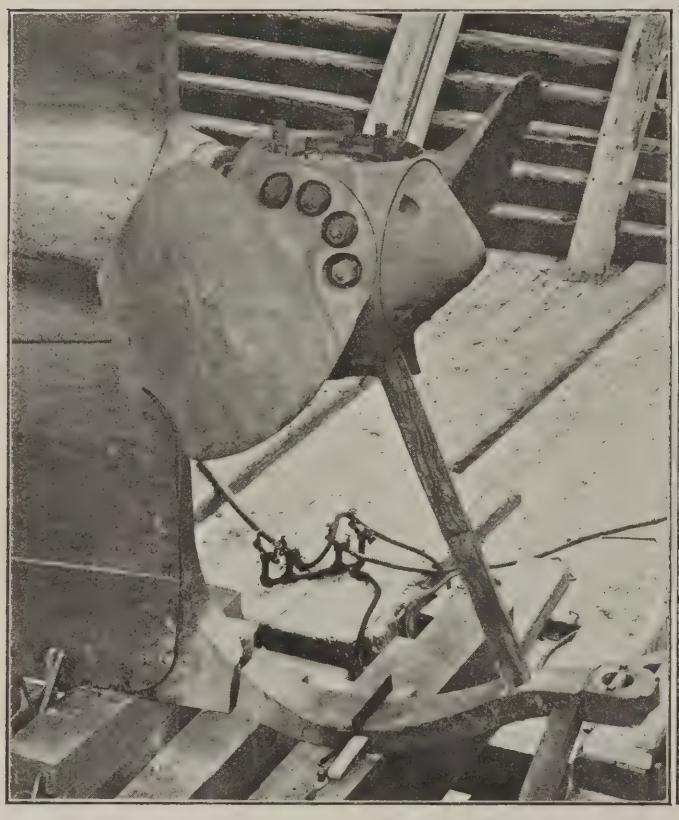
The size of the section at the fracture was 8½ x 12 in., and the weld was made in the usual way, building the mold around a wax matrix of the exact shape of the thermit steel collar or reinforcement which was to be provided.

After pumping out the dock on Friday, Aug. 19, the rudder was unshipped. On Saturday the broken shoe was lined up and other preliminary work attended to. No work was done on Sunday, and on Monday the wax matrix was applied and the mold box rammed up. On Tuesday the crucible was adjusted, the parts well preheated by means of a thermit preheater, and the weld was made at 1:30 p. m.

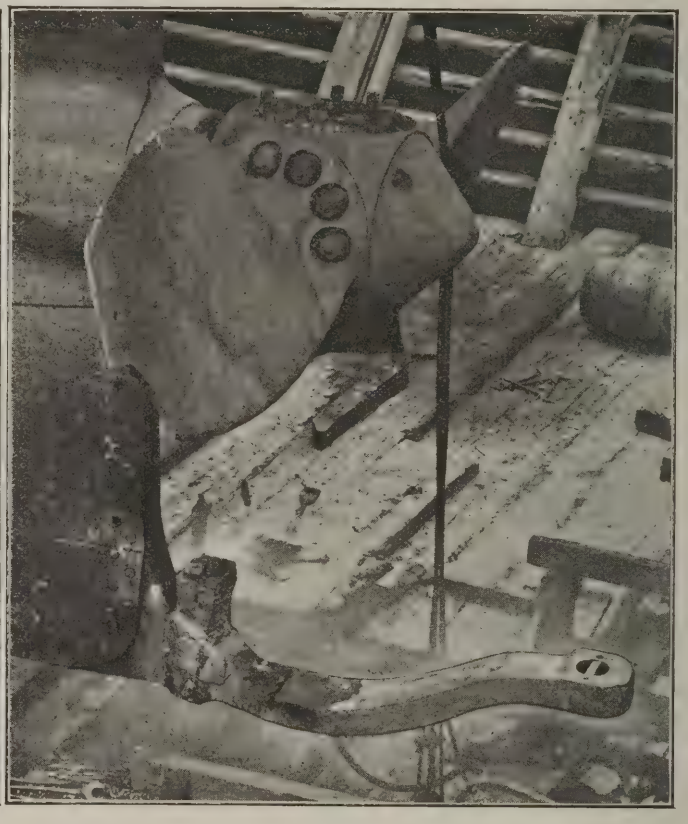
This operation required 600 lb. of thermit, 120 lb. of mild steel punchings and 12 lb. of crushed manganese.

The weld was allowed to stand over night and on Wednesday, while still quite hot, the mold was dismantled and the metal left in the gate and riser removed. Some of the metal at the bottom part of the collar was also removed so as not to increase the draught of the vessel at that point.

The work was executed under the direction of the Goldschmidt-Thermit Co., 90 West street, New York.



SHOWING BROKEN PART LINED UP, READY FOR WELDING.



VIEW OF FINISHED WELD, SHOWING METAL LEFT IN GATE AND RISER.

Steam Development

R. H. Thurston, of Cornell University, states in an article written by him for the Encyclopedia Americanna, that in the year 120 B. C., there was found at Alexandria a manuscript which proved to be a Hero's "Pneumatica," and, although the power of steam in connection with some sort of an engine has undoubtedly been known to mankind since the prehistoric period, this, however, is the first record of the steam engine and describes what is in all probability, the most simple steam turbine possible of construction.

There is, however, very little record of anything like a steam engine of today until 1705, when there was patented by Thomas Newcomen and his partner, John Calley, the first properly so-called steam engine. This consisted of a steam cylinder and piston actuating a beam above, from which was pendant the pump rod operating the pumps in the shaft of a mine; it was always used as a steam pumping engine, but was later improved by the addition of various valuable devices which gave James Watt his fame and fortune. This type engine became known later as the Cornish engine, and after Newcomen's death, was further improved in details by Desaguliers and by Smeaton. In 1718, the first automatic valve-motion was carefully designed by Henry Beighton. This, with Watt's invention of the separate condenser, the steam jacket, double-acting engines, the governor, etc., step by step, produced the engine that is the real basis of those we have in use at the present time.

From the small engines of the early part of the nineteenth century, to

those of the present time, is a change a little hard to appreciate, for it is estimated that the work of the world is performed by steam engines mainly, probably amounting to 150,000,000 H. P. and equivalent to the working power of several times the population of the globe, if employed in manual labor.

The wonderful growth of the steam engine is further evidenced by a letter recently received from the Penberthy Injector Co., of Detroit, stating that on March 29, 1910, Injector No. 600,000 was stamped and recorded ready for delivery. When one stops to consider that the above company, the largest manufacturers of injectors, in the world, has since 1887 made 600,000 of their automatic injectors, one obtains some idea of the large horsepower of the boilers which must be in operation at the present time, for it has been carefully estimated that 600,000 (size 2½-in.) GG Penberthy injectors would force into a boiler against 90 to 100 lbs. pressure over 1-3 of the amount of water that is constantly going over Niagara Falls, which is approximately 125,000,000 to 150,000,000 gallons per minute. This when transformed to steam at 70 lb. pressure is sufficient to develop power amounting to approximately 700,748,661 horsepower, or very near five times the estimated horsepower of the world's steam machinery.

Should the growth of steam power increase in the next hundred years as it has in the past, we will have as a result a combined horsepower capable of performing work the magnitude of which would be so great as to be almost inconceivable to the average person of today. The likelihood of the development in steam power during the next century, however, is not so much in a larger number of engines and boilers, although this is, through the natural growth of the universe, inevitable to a certain extent, but rather in an increased efficiency in those power plants which are to replace those that, because of age and wear, are constantly being discarded.

Motor-Driven Warships

The report that the British admiralty has decided to try the experiment of a motor-driven battleship, with internal combustion engines, though not officially confirmed, has naturally aroused the keenest interest in naval and engineering circles. The admiralty is maintaining a strict reserve as to the developments contemplated, but in the best of informed circles the belief is that the first step will be to equip a torpedo boat destroyer, and at a later date one of the smaller class of cruisers. Though some doubts are held as to the accuracy of the report relating to a motor-driven battleship, there is every reason to believe that the remarkable advance made in the efficiency of motor engines has engaged the serious attention of the admiralty, and the fact that the Hamburg-American Line has ordered a 9,000-ton steamer for their Atlantic trade, has, naturally enough, stimulated interest in this method of propulsion for large vessels. It is clear that even if the admiralty have not gone to the length of actually deciding to lay down a battleship on these lines, a development of this nature is absolutely certain in the near future.

One of the foremost marine motor engineers in Britain has stated that, though he was unaware of what were the real intentions of the British admiralty in regard to their reported intention to build a marine motor battleship, fitted with internal combustion engines, he had heard from a good source that an internal combustion engine of 10,000 H. P. had been ordered by the admiralty. The difficulty of constructing a satisfactory engine of such power, he pointed out, was extremely great. To drive a battleship of the Dreadnaught type, he added, engines of not less than 30,000 H. P. would be necessary, but should these be successfully produced, their installment on a warship in the place of the existing machinery would undoubtedly effect a valuable saving in weight and space. It was, however, unlikely that the British admiralty would put gas engines into a battleship or big cruiser until this type of engine had been brought to much greater perfection than at present.

A naval correspondent of the London *Standard* also says:

"The following facts, which I have every reason to believe are substantially correct, have come to my knowledge. I believe they furnish the real explanation of the rumor current at Portsmouth that a motor-driven battleship is to be constructed. A set of gas engines of 20,000 H. P. has been built in Lancashire. They are to be run experimentally for about a year. After they have run some three months, and provided that the running promises success, a second set of engines is to be constructed. One of the new 'Town' class of cruisers has been alternately designed to receive gas engines instead of a steam installation. Should the experimental gas engine running proceed satisfactorily, then the new set will be fitted in the cruiser. In such case she would be running in about eighteen months from now."

Additional evidence that the admiralty have something big up their sleeve is the fact that the successor to H. M. S. Orion on the building slip will not be commenced until the new year. This delay is so unusual as to have caused much comment for a long time, and the government has been greatly blamed locally. But if the warship to be next built at Portsmouth is to be the subject of an epoch-making departure then the delay explains itself quite naturally. It is noteworthy, too, that at all our great naval ports huge and well-protected oil tanks have been completed to store tens of thousands of tons of oil fuel, and mooring jetties erected alongside at which warships may lie and receive their supplies through a flexible hose.

Further, the admiralty has ascertained that naval oil fuel supplied need not come from foreign countries, which would be very unsatisfactory in time of war, for, in addition to the Scotch shale-oil distilleries, big oil-producing areas are being developed in British Guiana.

The important point is that nowhere in Portsmouth naval circles is the report of a motor-driven battleship, to be built at an early date, discredited, and, seeing how secret are all the doings of the admiralty nowadays, since the introduction of the Dreadnought regime, it is assumed that the statement made is in substance correct.

Experimental Tank for Ship Builders

The Ship Building and Engineering Employers' Federation, the wealthiest combination in Great Britain, is putting forward a scheme to aid ship builders and engineers engaged in the construction of warships and high-speed passenger mercantile vessels. The federation proposes to establish in London an experimental tank which would be valuable for all ship builders to carry out experiments with a view to securing greater stability and increased speed. A highly-skilled staff will also be provided. The scheme, if accepted, as it is likely to be, by the members of the federation, will be invaluable to the ship building interests of Great Britain.

Owing to serious illness, the family of Henry Fiesler, a lake engineer, residing at Mt. Pleasant, O., are desirous of communicating with him as soon as possible.

Book Reviews

Christian Unity in Effort.—By Frank J. Firth. 273 pages. J. P. Lippincott Co., Philadelphia, Pa.

F. J. Firth, the author of this book, as president of the Erie & Western railroad, operating the Anchor Line fleet of steamers on the lakes, was a very well known figure on the lakes until his retirement a few years ago. He is one of the past presidents of the Lake Carriers' Association. That he should produce such a book as this in his reflective moods is not surprising to those that know him. The book records some personal thoughts and beliefs and represents a conviction that every man and woman should acquire by individual effort such personal faith as is essential to a well rounded life.

The purpose of the book is to help the sincere seeker after truth to rise to a purer life of intelligent faith. He epitomizes the law of religious development in the old teaching as summarized by Solomon, based upon fear: "Fear God and keep his commandments, for this is the whole duty of man;" and the new teaching as founded in the new testament and illustrated in the parable which Christ related in answer to the question "Who is my neighbor," asking at its close. "Which now of these three, thinkest thou, was neighbor unto him that fell among the thieves?" And the lawyer answered: "He that showed mercy on him." Then said Jesus unto him: "Go and do thou likewise."

The law of development in things spiritual is again exemplified in the sermon on the mount. The rule of fear had been replaced by the rule of love. The book presents a thorough study of both the old and new testaments and the development of the creeds.

The concluding chapters are devoted to the great religious bodies and their numerous divisions. It is estimated that Christians number 400,000,000; Buddhists, 400,000,000; Mohammedans, 250,000,000; Brahmans, 150,000,000 and probably 300,000,000 Pagan or heathens.

Mr. Firth briefly traces the history of these four great religious beliefs. Mr. Firth also devoted some attention to Unitarianism, with which faith he apparently is personally in great sympathy.

His closing chapters are devoted to the history of the church in the United States. He puts the Protestant population of the United States at 65,600,000 and the Catholic at 14,600,000. He then defines the different theories of religious life as followed by the denominations. Briefly it may be stated that the Protestant basis of membership is belief and conduct; the Catholic, belief and obedience. Protestantism represent democratic theory of government, while Roman Catholicism represents autocratic theories. Mr. Firth briefly relates the history of the various denominations such as the Methodists, Baptists, Lutherans, Presbyterians, Desciples of Christ, Episcopalians and Roman Catholics.

The Catholic church, of course, occupies a unique position in this country. It is the only Christian denomination representing autocratic theory of religious life; it is the only denomination not distinctly identified with this country in its early history and theory of government; it is the only religious organization in this country having its controlling central government in a foreign land.

The closing chapter offers a few reflections upon the life hereafter.

New Fabre Line Steamer

The Fabre Line new twin screw steamship Sant Anna arrived at New York, Wednesday, Aug. 17, from Mediterranean ports. She was built at the shipyards of Le Forges et Chantiers de la Mediterranean, at Toulon, France. The steamer is 500 ft. long and 57 ft. wide, 14,000 tons, 10,000-horsepower. Her speed is about 18 knots. She accommodates eighty first cabin passengers in rooms for one or two only, with private bath and toilet.

Besides the comforts and conveniences installed for the benefit of first-class passengers, the steamer is equipped with refrigerating plants, electric light, Marconi wireless, watertight compartments, steam heat, electric ventilation, laundry, etc. The first-class accommodations are situated on three decks and all rooms are outside, occupying a position amidships. Cabin accommodations are entirely isolated from all portions of the steamer, and all details are so perfectly worked out that this section comprises in itself a floating hotel of sumptuous luxury. The two promenade decks are of magnificent proportions and completely encircle the superstructure and the forward portion is enclosed completely in glass, forming a veranda entirely protected in rough weather. The upper promenade deck is shaded by awnings and is particularly attractive for outdoor dining. On this deck is situated the Parisian Outdoor Terrace Cafe, smoking room and the wireless station. Telephones have been placed in each stateroom. The dining saloon occupies the forward portion of the upper deck and is divided into three sections by transversal arches. Tables are provided for from two to ten persons each, with or without a service a la carte. The chapel on board is available for religious services of all creeds and includes all necessities for the holding of Catholic services. There is on board an American bar, barber shop, baths and lavatories, servants' cabins and a dark room for passengers who may wish to personally direct the development of the result of their cameras.

The officials of the company state that the line has had nearly 30 years of success as Mediterranean carriers; and in addition to this new steamer, it has ordered another one, the keel of which will be laid in a few weeks and which will be called the Canada. The enormous size of the Sant Anna and of the Canada has made it necessary for the Fabre Line to seek new docking facilities, and it has built a new pier foot of Thirty-first street, South Brooklyn, one of the largest steamship piers in the world. It is 1,476 ft. long and 150 ft. wide, and the slips are 275 ft. wide and 35 ft. deep. The new pier is almost as long as eight city blocks. Railway tracks are to be laid the entire length of the pier.

Monel Metal Propellers

The four propellers for the battleship Florida, recently launched at Brooklyn, and which are to be cast in Monel metal by the Bayonne Casting Co., Bayonne, N. J., will be 10 ft. 6 in. diameter and will weigh approximately 8,000 lbs. each. The same company has a contract for 12 propellers for the two new Argentine battleships, which are under construction by the Fore River Shipbuilding Co., Quincy, Mass., and the New York Shipbuilding Co., Camden, N. J. These propellers will be 15 ft. 6 in. diameter and will weigh approximately 16,000 lbs. each, and are said to be the largest ever made of this alloy. The contract for these 12 propellers is also said to be the largest for Monel castings ever placed. The trend of propeller practice with turbine-driven ships is evident from the fact that all these propellers are of the solid type, which makes a complete spare propeller necessary in case of damage, as will be noted from the fact that the Argentine ships have a complete set of spares.

Some recent investigations carried on in the engineering laboratories of the University of Wisconsin with alloys of Monel metals and electrolytic iron, reported in *The Iron Trade Review*, indicate that remarkable results are to be looked for in the future from such mixtures, as, in addition to the high tensile strength and elastic limit, the mixture possesses high corrosion-resisting qualities.

A municipal dry dock, 1,000 ft. long, which can accommodate the largest vessels, has been proposed for New York by the dock commissioner, Calvin Tompkins.

Battleships Wyoming and Arkansas

The plans and specifications for the first-class battleships, Wyoming and Arkansas, authorized by act of congress, approved, March 3, 1909, were completed and circular signed by the secretary of the navy, June 14, 1909, and issued to the bidders upon request thereafter.

The general dimensions and features of each vessel are as follows:

Length on load water line, 554 ft.
Breadth, extreme, at load water line, 93 ft. 2⅝ in.
Mean trial displacement, 26,000 tons.
Mean draught to bottom of keel at trial displacement (about), 28 ft. 6 in.
Total coal bunker capacity (about), 2,500 tons.
Coal and fuel oil carried on trial, 1,933 tons.
Feed water carried on trial, 187 tons.
Speed on trial, not less than 20½ knots.

Armament:—
Main battery: Twelve 12-in. 0.50-caliber breech loading rifles; two submerged torpedo tubes.
Secondary battery: Twenty-one 5-in. rapid-fire guns; four 3-lb. saluting guns; two 1-lb. semi-automatic guns for boats; two 3-in. field pieces; two machine guns, caliber 0.30.

Bids for the construction of the above vessels were opened at the department, Aug. 18, 1909, and the contracts awarded on Sept. 13, 1909, the Wyoming to the Wm. Cramp & Sons Ship & Engine Building Co., of Philadelphia, Pa., at a price of $4,450,000, and the Arkansas to the New York Ship Building Co., of Camden, N. J., at a price of $4,675,000, both to have the department's design of machinery installed.

The vessels are to be completed on or before the expiration of 32 months from the date of signing the contract. The contract for the Wyoming was signed, Oct. 14, 1909, and for the Arkansas, Sept. 25, 1909.

The percentage of degree of completion of the hull on Aug. 1, 1910, was 32.3 per cent for the Wyoming and 39.5 per cent for the Arkansas.

Cold Storage Barge

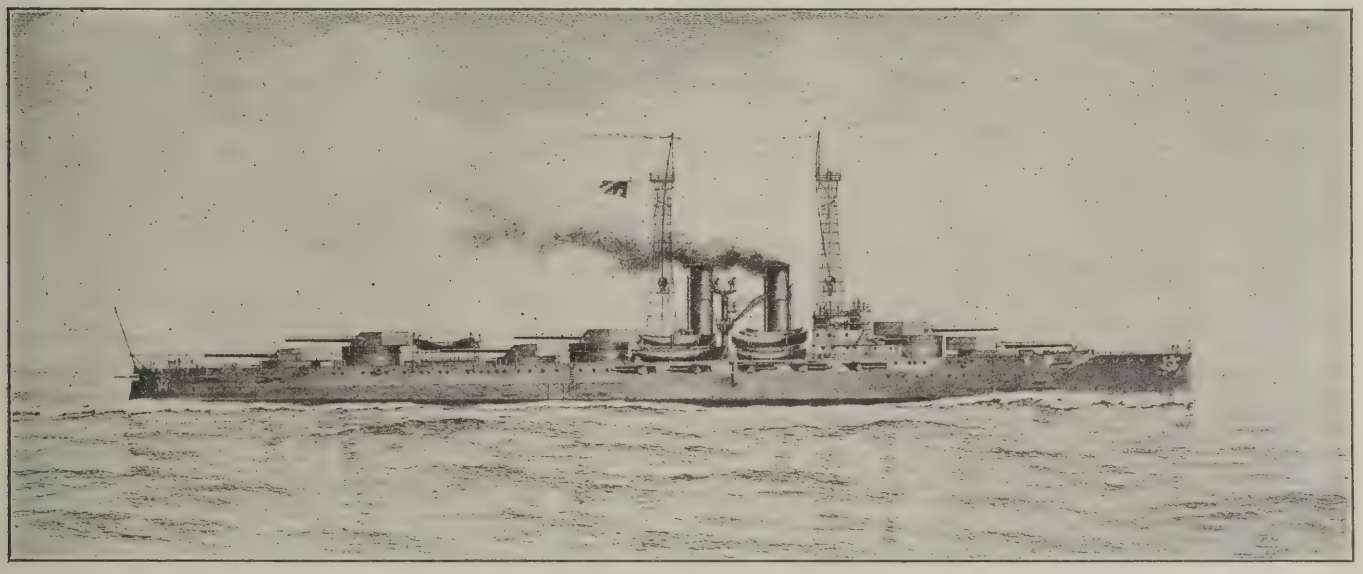
Cammell, Laird & Co. have just completed for the Sociedad Anonima, La Blanca, Buenos Aires, a novel cold storage barge for carrying chilled meat from their La Blanca works. The dimensions of the new barge are:

Length between perpendiculars, 207 ft.; breadth moulded, 36 ft., and depth moulded, 22 ft. She is built to Lloyd's scantlings, and has two complete steel decks, and is divided by bulkheads into two large holds. These holds are fully insulated and equipped with the latest arrangement of runner rails and meat hooks for carrying the carcases, and have a special loading chamber on the center extending to the bottom of the ship and fitted with large and insulated doors to each hold. The capacity of the insulated spaces is 80,000 cu. ft.

The vessel has five watertight bulkheads and a large fore peak tank for trimming purposes, filled and emptied from the engine room. The deck equipment is very complete, comprising steam windlass, two steam winches, steam capstan aft and steering gear on captain's house; two steel derrick posts are fitted for working three derricks, and capable of lifting two tons, for loading and discharging purposes. Each hold has two large insulated hatchways, and besides the usual covers, steel rolling covers on rails are provided for covering the hatchways in the event of a sudden storm. The vessel is lighted throughout with electric installation, and has large cargo clusters on deck for loading and discharging at night.

The four meat holds, which are of approximately equal capacity, are heavily insulated with selected granulated cork with linings of p. t. and g. boards, with an interlining of waterproof insulating paper. Heavy insulated hatch covers are fitted to each of the hatches and insulated doors are fitted in the midship hatch to form the entrance to the chambers from the same. Each chamber is separately insulated so that any temperature can be maintained in any one space as required. The refrigerating machinery is throughout of the duplex type, and includes horizontal compound duplex ammonia machine of the marine type, and having high and low-pressure cylinders arranged side by side, driving from the tail rods to horizontal double-acting ammonia compressors.

The brine distribution is on the Webb and others patent attemperated system, and the arrangements are such that brine of higher or lower temperature can be supplied to any of the chambers independently, so that the temperatures can be absolutely and positively controlled exactly as required. For the quick loading and discharging of the vessel, each chamber is fitted with a complete outfit of rails, supported from the deck beams, for runner meat hooks. Each rail is controlled by a patent switch, so that any quarter loaded in from the main hatch can be run on any rail or into any part of the chamber. In way of the twin hatches at the forward and after ends of the vessel an adaptation of Webb and others patent portable hatch rails has been fitted. The rails in wake of each of these hatches are so arranged that they can be lifted out or lifted in with the meat on them, which arrangement greatly facilitates both loading and unloading. This barge marks a great advance in anything previously built for the transportation of meat under refrigerated conditions, both as regards the exact and complete control of temperature and the facilities for loading and discharging.



DRAWING OF THE BATTLESHIPS WYOMING AND ARKANSAS AS PREPARED BY THE NAVY DEPARTMENT.

ACCIDENTS TO LAKE VESSELS

THE most serious accident to the lake fleet during August was the grounding of the steamer Thomas F. Cole, flagship of the Pittsburg Steamship Co.'s fleet, about 6 miles off Detour, during a heavy smoke on Aug. 24. General regret is expressed in lake circles over Capt. Morgan's misfortune, but accidents will happen to the best of men.

The Cole was bound up light and she went on hard for over half her length, puncturing a number of her starboard tanks. She was exposed to southerly and westerly winds, and as the weather was fresh every effort was made to expedite her release. The wrecker Favorite was rushed to her assistance and released her within a few hours after reaching her, much to the company's surprise and relief, as it looked like a long job. The Cole returned to Lake Erie and was docked at Lorain. Examination of her bottom revealed the fact that she had 92 damaged frames and that 45 plates would have to be taken off.

The barge J. H. Pellett, belonging to the Kelley Island Lime & Transport Co., was in collision with the car ferry, Marquette & Bessemer No. 15, between Ashtabula and Conneaut, on Aug. 10. Her bow was crushed in practically to the collision bulkhead and the wonder is that she did not go to the bottom. Capt William Kelley, master of the Pellett, was knocked into the hold by the force of the collision and was pretty badly shaken up. The Pellett was in tow of the tug W. B. Sanders at the time. The Sanders towed her to Cleveland, where she was put in dry dock.

The steamer Moses Taylor ran aground in a fog near Sarnia and broke her shoe. A description of the repairs to the shoe by the thermit process will be found elsewhere in this issue.

The steamer Schoolcraft was sunk in collision with the steamer Amazon in the St. Clair river. Her stem was pretty badly twisted, but after temporary repairs were effected she was taken to Buffalo.

DATE.	NAME OF VESSEL.	NATURE OF ACCIDENT.	LOCATION.
Aug. 4	Str. Avon	Collided with Str. S. N. Parent	Welland canal.
Aug. 4	Tug Joe Harris	Hit by Str. Starucca; repaired at Cleveland	Cuyahoga river.
Aug. 4	Str. S. N. Parent	Collided with Str. Avon	
Aug. 5	Str. Canadiana	Fender strake ripped off 25 ft. while trying to make landing in gale; all fenders on starboard side carried away	Crystal Beach, Lake Erie. Welland canal.
Aug. 7	Str. Huronic	Machinery disabled; stopped one day at Sault for repairs	Near Sault canal.
Aug. 8	Bge. Montana	Sprang a leak; crew taken off and tow line cut from Str. Fairmount; latter picked up by passing steamer	Port Clinton, Lake Erie.
Aug. 9	Str. C. Tower	Sank at her moorings, blocking passage	Milwaukee.
Aug. 9	Tug Welcome	Broke down; towed to port by Tug Dunkirk	Lake Erie, off Cleveland.
Aug. 10	Bge. J. H. Pellett	Collided with car ferry M. & B. No. 15; bow crushed in almost back to collision bulkhead; docked at Cleveland; M. & B. 15 not damaged	Between Ashtabula and Conneaut, Lake Erie.
Aug. 12	Str. Moses Taylor	Ran aground in fog; released herself; shoe broken off close up to stern-post and two buckets lost off wheel; towed to Cleveland and docked on Aug. 17; shoe welded by Thermit process; new rudder put on	Near Sarnia, St. Clair river.
Aug. 15	Str. E. B. Osler	Stranded; released on Aug. 17 after lightering 1,000 tons of coal; did not reload all of lightered cargo	Middle Ground, St. Clair river.
Aug. 15	Tug Booth	Broke her shaft while pulling on stranded Str. Osler	St. Clair river.
Aug. 17	Str. Panay	Stranded, but released herself; pumps kept her free and she proceeded	Above Canadian lock, Sault.
Aug. 18	Str. Amazon	Collided with Str. Schoolcraft; not damaged	Lake St. Clair.
Aug. 18	Str. Schoolcraft	Collided with Str. Amazon; bow badly damaged, sank in shallow water; stem twisted; temporarily patched up; repaired at Buffalo	Lake St. Clair.
Aug. 20	Str. Lakeside	Rail and cabin damaged while landing	Buffalo.
Aug. 20	Str. Hoover & Mason	Steering gear broke and she ran on bank; released herself	Bar Point, Detroit river.
———	Str. Neebing	Grounded; broke couple of buckets off wheel	Georgian Bay.
Aug. 22	Str. Emma C. Tyson	Capsized owing to swells from passing steamer; 215 tons of coal, as well as boiler, dumped into river	Detroit river.
Aug. 22	Str. Ogdensburg	Ran aground when steering gear became disabled	Elliott's Point, Detroit river.
Aug. 22	Str. Reynolds	Wheel chains parted; by dropping both anchors saved herself from hitting rocks	Head of Livingstone channel, Detroit river.
Aug. 24	Str. Thomas F. Cole	Stranded in heavy smoke; released on Aug. 25 and taken to Detour; all tanks on starboard side leaked; docked at Lorain, Aug. 30; 92 frames damaged and 45 plates taken off	Near Detour, Soo river.
Aug. 24	Str. Homer Warren	Grounded at turning point; released herself, uninjured	Mud Lake.
Aug. 25	Str. Bennington	Hatch covers and woodwork damaged by fire while lying alongside burning elevator	Ogdensburg, N. Y.
Aug. 25	Str. C. C. Hand	Ran aground; released by Tug H. D. Goulder	Grassy Island, Detroit river.
Aug. 25	Str. Sahara	Ran aground; released on Aug. 27; reloaded lightered cargo	St. Clair river.
Aug. 26	Schr. Alice B. Norris	Dismasted in storm	Near Whitehall, Lake Michigan.
Aug. 26	Str. Powell Stackhouse	Struck by car ferry Grand Haven; number of plates damaged	Milwaukee, Wis.
Aug. 28	Str. Bulgaria	Stopped for repairs to broken crosshead	Canadian Sault.
Aug. 29	Str. Flagg	Ran aground; released by Tug Goulder	Near Huron, Lake Erie.
Aug. 30	Str. Castalia	Struck an obstruction, puncturing compartment No. 1; stopped at Port Huron, where air compressors were put aboard and she left for Cleveland, where she was docked	Near Corsica Shoal Lightship.
Aug. 31	Str. Lakeland	Grounded on a reef; released Sept. 1, uninjured	Thunder Bay river.
Sept. 1	Str. W. K. Bixby	Collided with Str. F. B. Wells; starboard anchor smashed, hawse pipe broken and number of plates dented; repaired before she sailed; Str. Wells not injured	Ashtabula.
Sept. 4	Str. Italia	Ran aground	Raber's Point, Mud lake.

The Western Dry Docks Co., Port Arthur, has placed orders for one large plate shear, one bending roll, one angle shear, one lathe and one drill, with the John Bertram & Sons Co., Dundas, Ont.; for electrical equipment with the Canadian Westinghouse Co., Hamilton, Ont., and for pumping machinery with the John Inglis Co., Toronto.

Roy M. Wolvin has organized the Duluth Shipping Co., with H. H. Dunham in charge of the Duluth office and Roy A. Williams in charge of the Cleveland office.

Arthur H. Vogel, of Milwaukee, was the lowest bidder for excavation work in the channel in Niagara river, below the Black Rock ship canal lock. His bid was $532,100.

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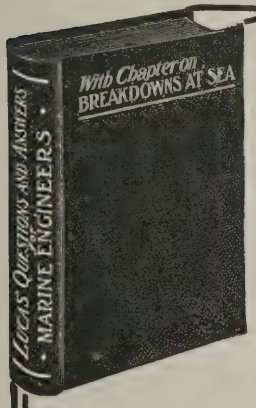

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Commerce of Lake Superior

The commerce of Lake Superior, as measured by the Sault Ste. Marie canals, reached the respectable figure of 9,744,556 net tons during August, being 230,617 tons less than the movement during July, when 9,975,173 tons were moved. The movement to Sept. 1 totals 40,046,800 tons, as against 29,812,256 tons during the corresponding period last year. The figures for the coal movement rather belie the apparent lassitude in that trade and again prove the fact that the lakes handle enormous units so easily as to be really deceptive. The summary is as follows:

EAST BOUND.

	To Sept. 1, 1909.	To Sept. 1, 1910.
Copper, net tons	65,499	77,070
Grain, other than wheat, bushels	13,831,382	22,068,070
Building stone, net tons.	1,125	6,990
Flour, barrels	2,969,368	3,791,428
Iron ore, net tons	21,320,149	28,055,531
Pig iron, net tons	17,549	19,331
Lumber, M. ft., B. M.	315,129	374,379
Wheat, bushels	24,497,194	32,695,234
Unclassified freight, net tons	89,654	87,357
Passengers, number	22,755	23,594

WEST BOUND.

Coal, anthracite, net tons.	798,545	1,060,259
Coal, bituminous, net tons.	4,802,158	7,297,788
Flour, barrels	1,805	1,100
Grain, bushels	1,000	2,100
Manufactured iron, net tons	272,979	247,327
Iron ore, net tons	8,213	.....
Salt, barrels	444,404	397,367
Unclassified freight, net tons	522,188	724,787
Passengers, number	24,652	27,567

SUMMARY OF TOTAL MOVEMENT.

East bound, net tons	23,341,909	30,657,557
West bound, net tons	6,470,347	9,389,243
Total	29,812,256	40,046,800

The total number of passages to Sept. 1, 1910, was 13,118, and the net registered tonnage, 32,540,548.

A New Water-Tube Boiler

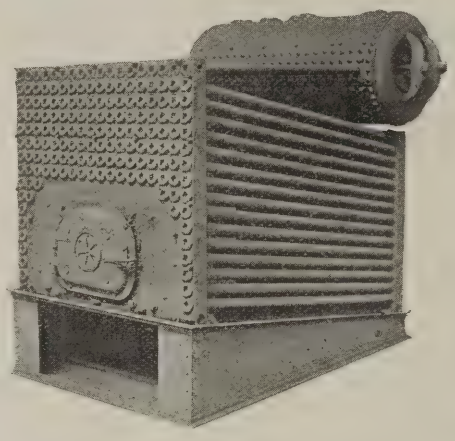
The accompanying illustration shows a new type of straight tube boiler for marine and stationary use, built by the Charles Ward Engineering Works, Charleston, W. Va.

The boiler shown is one of the smaller sizes and has 470 sq. ft. of heating surface and 19 sq. ft. of grate, and weighs, complete, 5,730 lb., built for a working pressure of 200 lb. steam.

The front and back headers for receiving the tubes are steel castings of rather novel design. The walls or plates are ½ in. thick, with a water space between. The two walls are connected to each other by vertical webs between each alternate vertical row of tubes, thus forming rectangular water passages. The webs stop a few inches from the top and bottom of the header, giving a passage connecting each vertical row and affording perfect circulation.

The back header has a flanged connection to the bottom of the drum, which gives the down-flow passage and completes the circulation, which, due to the incline of the tubes, is free and unobstructed, each vertical row having its individual return tube to the drum.

The boiler shown has 148 generating tubes, 2 in. diameter, and 18 return tubes, 1⅝ in. diameter. All tubes are expanded into the headers and drum,



WARD'S NEW WATER-TUBE BOILER.

no screwed joints in or near the fire. Screwed plugs opposite each tube give free access for cleaning or removing the tubes. Any tube can be removed and replaced without disturbing any of the others.

The furnace door opening is water-lagged with ample passages to insure perfect circulation, eliminating all trouble with cast iron liners and fire brick.

The casing is substantially constructed of sheet steel and angles, lined with ½-in. asbestos, the front and back are easily removed for access to the tubes.

The floor space required is 4 ft. 3 in. by 6 ft. 3 in., and the height in front is 5 ft. 2 in. The heating and grate surface may be varied by lengthening the tubes and grates, each additional foot of length increasing the heating surface about 80 sq. ft.

These boilers are built in standard sizes, but dimensions may be varied to suit requirements. The larger sizes are constructed entirely of open-hearth steel plates, the headers riveted together and stayed by an improved method, which insures freedom from troublesome screwed and riveted stay-bolts, there being no openings through the plates except the tube holes. In these sizes, the openings in front of the tubes are closed by small hand-hole plates—no screwed plugs.

The builders now have under construction a boiler of this type, 9 ft. wide, with 432 tubes, 2 in. diameter and 36 tubes 3½ in. diameter, giving about 2,000 sq. ft. of heating surface, the steam drum being 40 in. outside diameter and located on front header, which is the low end of the boiler.

Obituary

Thomas F. Griffin, formerly connected with the firm of Corrigan, McKinney & Co., of Cleveland, and known from one end of the lakes to the other through his wide knowledge of the ore trade, died at Colorado Springs, on Monday, Aug. 29. It became apparent about eight years ago that he was afflicted with tuberculosis. The firm thought so much of him that Mr. Corrigan sent him to Mexico in his private car, where he remained the greater part of a year. He later returned to Cleveland, but it was soon apparent that the climate of the lower lake region was too rigorous for him. He removed with his family to Colorado Springs seven years ago. He leaves a widow. Mr. Griffin was about forty-two years old.

Capt. John Green, one of the notable men on the great lakes, died at Buffalo, on Saturday, Aug. 27. Capt. Green was born near Dublin, Ireland, on Dec. 27, 1832. When eight years old his parents emigrated to Toronto, where his father died two years later. He began sailing at the age of ten. He secured a first mate's certificate within a few years. Later, seeing the possibilities in harbor towing, he went into that branch of the business and became the owner of a number of tugs. He was a blunt, straightforward man and was much respected.

Pere Marquette No. 18 Founders

Carferry Pere Marquette No. 18, owned by the Pere Marquette Railroad Co., and operating between Ludington and Milwaukee, sank off Sheboygan, on Sept. 9, drowning 28 members of her crew. The cause of the disaster is not as yet known. The carferry left Ludington at 11:30 p. m., with 29 loaded cars. There was a fresh wind blowing, but the carferry was apparently making good weather of it until 4:30 a. m., when she was observed to be taking water rapidly aft. She was headed with all speed for the Wisconsin shore, working her pumps meanwhile and flashing wireless messages for help. Several cars were run overboard to lighten her, but at 7:30 o'clock she suddenly sank. Meanwhile Pere Marquette No. 17 responded to the distress signals and arrived on the scene just as No. 18 went down. Lifeboats were lowered and about thirty members of the crew were picked up. Pere Marquette No. 18 was built at the Cleveland yard of the American Ship Building Co., in 1902.

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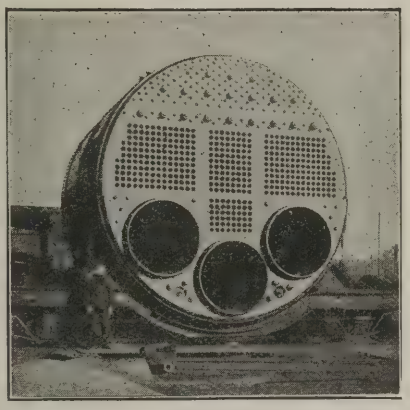

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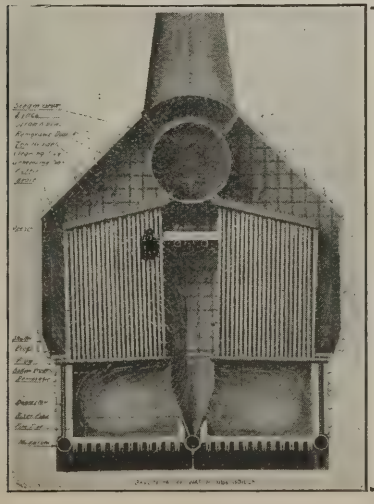

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CATALOGUE AND PRIGES ON APPLICATION

Welin Davit and Lane & De Groot Co.

The Welin Davit and Lane & De Groot Co. are removing their main office from New York to Long Island City, though for the time being the office at 17 Battery Place will be retained. The company reports an unusually successful season. In the boat and launch department its sales have increased about 50 per cent over last year's sales. The company sold during the spring of 1910 some 10,000 A B C life preservers, manufactured and delivered 180 life boats, 20 rafts and 18 steel and wooden launches. It has just completed and delivered a 28-ft. launch to the Coast & Geodetic Survey and six power boats to the Light House service.

The new Goodrich liner Alabama, which went into commission on the great lakes during the latter part of June, is entirely equipped with the company's life saving apparatus, including boats, davits and life preservers. These davits are fitted with a new lowering drum arrangement which is an innovation in gear of its kind and the Alabama is the first to carry it.

The Olympic and Titanic, the two White Star liners now building, will be entirely equipped with Welin davits of the double quadrant type which permit of carrying two boats under one set of davits. On the basis of this design the British Board of Trade has made a new ruling, permitting the carrying of one boat inboard provided it is stowed directly alongside a boat which is placed under davits.

Orders booked for Welin quadrant davits in recent months include the following:

Steamers—Ancon, Isthmian Canal Commission; Christobal, Isthmian Canal Commission; J. A. Chanslor, Associated Oil Co.; Bear, San Francisco & Portland Steamship Co.; Beaver, San Francisco & Portland Steamship Co.; Daniel Willard, Erie Railroad Co.; Gen. Geo. H. Weeks, United States Government; Gen. S. B. Holabird, United States Government; Gen. D. S. Stanley, United States Government; Alabama, Goodrich Transit Co.; Aloha, Curtis James; Fulton, D., L. & W. R. R.; Honoluluan, American-Hawaiian Steamship Co.; Seminole, Southern Pacific Co.; Navajo, Southern Pacific Co.; Ensinal, Southern Pacific Co.; Melrose, Southern Pacific Co.; Rikers Island, New York City; new ferry, Newburgh Ferry Co.; new steamship, building at Dubuque, Ia.; hull 108 (building at New York Ship Building Co.'s Works), Merchants and Miners Transportation Co.; hull 109 (building at New York Ship Building Co.'s Works), Merchants and Miners Transportation Co.

SUMMARY OF NAVAL CONSTRUCTION.

Name of Vessel.	Speed, Knots.	—Building at—	—1910— Per cent of completion July 1.	Aug. 1.
		BATTLESHIPS.		
Florida	20¾	Navy Yard, New York	68.8	71.0
Utah	20¾	New York S. B. Co.	80.0	83.2
Wyoming	20½	Wm. Cramp & Sons	28.4	32.3
Arkansas	20½	New York S. B. Co.	34.6	39.5
		TORPEDO BOAT DESTROYERS.		
Paulding	No. 22	Bath Iron Works	92.4	93.4
Drayton	No. 23	Bath Iron Works	86.1	88.1
Roe	No. 24	Newport News S. B. Co.	92.3	97.1
Terry	No. 25	Newport News S. B. Co.	89.7	91.5
Perkins	No. 26	Fore River S. B. Co.	86.8	92.3
Sterett	No. 27	Fore River S. B. Co.	83.8	88.4
McCall	No. 28	New York S. B. Co.	85.4	89.6
Burrows	No. 29	New York S. B. Co.	85.2	87.5
Warrington	No. 30	Wm. Cramp & Sons	74.4	79.5
Mayrant	No. 31	Wm. Cramp & Sons	79.1	80.8
Monaghan	No. 32	Newport News S. B. Co.	26.7	28.4
Trippe	No. 33	Bath Iron Works	49.9	56.7
Walke	No. 34	Fore River S. B. Co.	39.1	47.6
Ammen	No. 35	New York S. B. Co.	48.5	56.3
Patterson	No. 36	Wm. Cramp & Sons	33.0	40.7
		SUBMARINE TORPEDO BOATS.		
Salmon	No. 19	Fore River S. B. Co.	97.4	97.8
Carp	No. 20	Union Iron Works	58.6	60.0
Barracuda	No. 21	Union Iron Works	58.6	60.0
Pickerel	No. 22	The Moran Co.	53.1	56.8
Skate	No. 23	The Moran Co.	53.1	56.8
Skipjack	No. 24	Fore River S. B. Co.	45.3	48.6
Sturgeon	No. 25	Fore River S. B. Co.	43.7	46.2
Thrasher	No. 26	Wm. Cramp & Sons	6.4	7.9
Tuna	No. 27	Newport News S. B. Co.	28.3	29.9
Seal	(Lake)	Newport News S. B. Co.	51.2	52.2
		COLLIERS.		
Cyclops		Wm. Cramp & Sons	79.3	84.3
No. 8		Maryland Steel Co.	34.9	37.9

Seneca Chain Co.

The Seneca Chain Co. has just awarded contract for the construction of its new chain and forging plant, at Kent, to the Mt. Vernon Bridge Co., Mt. Vernon, O. These new buildings will cover approximately an area of three and one-half acres and will be constructed entirely of steel and iron on concrete foundations. A large quantity of new and modern power and operating equipment will be installed with a view of securing the most economical production with the greatest efficiency of operation. The capacity of this new plant is somewhat larger than that of the old plant, destroyed by fire on Dec. 10, 1909, and with the plant at Mansfield, will make it possible for this company to largely increase its output. It is expected that the new plant will be completed by November or December 1. Two new testing machines will be installed, making it possible to manufacture the largest size of chains in use today for any purpose, but especially in the line of anchor cables for large steamers and battleships.

A Curious Occupation

Probably no hill in the world, says the *London Graphic*, has had so strangely varied a history or played so important a part in the affairs of men as that at Greenwich. The granite line across the foot-path on its summit is the meridian from which the longitude on every British map and chart is calculated. All England sets its time by the mean solar-clock. There is a large galvano-magnetic clock fixed on the outside wall of the observatory and divided into 24 hours. There are still many who believe this clock is kept going by the sun. They do not know that the fixed stars are the real time-keepers from which Britishers check their daily progress. To this galvano-magnetic clock in the wall comes every Monday a woman, who makes $2,500 a year out of the queerest occupation in England. She sells the time to London watchmakers. Her name is Miss Belleville, of Maidenhead. Eighty years ago, the then astronomer royal suggested to her father that if he took the corrected time of a certified chronometer every week, he could no doubt find numerous clients. So he bought a famous watch made for the Duke of Essex, one of the sons of George III, and soon worked up a business with it. When he died, his widow sold the time till she reached the age of 81, and then she handed the business over to her daughter. When Miss Belleville visits Greenwich at the beginning of every week, her chronometer is corrected and she is given an official certificate. From that her fifty customers correct their watches and clocks.

The torpedo boat destroyer Drayton was launched from the ship yard of the Bath Iron Works, Bath, Me., on Aug. 22.

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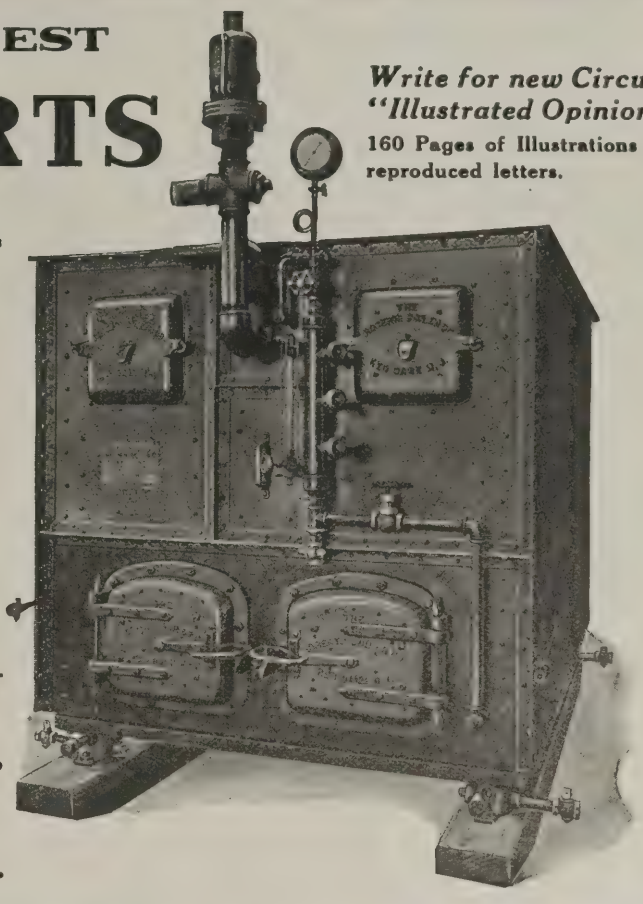

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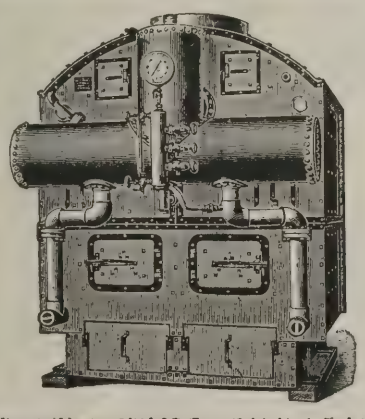

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Almy Water-Tube Boiler Co. PROVIDENCE R.I., U.S.A.

The Extinction of Our Merchant Marine

(From the *Scientific American.*)

We seem to be within measurable distance of the time when we shall have to substitute the word "extinction" for "decline" in speaking of our once famous merchant marine, which, in the earlier half of the last century, held a more commanding lead among the fleets of the world than is held today by the shipping of Great Britain. In view of the usually quick response of the American people to any appeal which touches their national pride, the general apathy with regard to the disappearance of our ships from the high seas is a problem for which it is impossible to find an adequate solution.

With a reiteration which would become tiresome were not the issues at stake so enormous, it has been proved to a demonstration that the economic conditions in the United States affecting the construction and operation of ocean-going steamships are such, that the only possible way to resuscitate our merchant marine and carry it along until it has attained a sufficiently lusty growth to hold its own in competition with the fleets of the world is for the government to step in and afford some measures of relief.

So frequently has the *Scientific American* laid before the public the unanswerable arguments in favor of government assistance that we hesitate to repeat them; but the facts recently given in the investigation before a special house committee by A. H. Bull, of New York, are so convincing that we feel constrained to repeat them in these columns.

Mr. Bull is the owner of two freight steamships of the same tonnage, one of which sails under the American flag and the other under the British flag. In order to make his comparison the more complete, the witness put in evidence data which he had gathered from the German naval records regarding the expenses of a similar steamship sailing under the German flag. The total wages of the crew on the American ship per month are $1,470; on the British ship, $897.04; and on the German ship, $483.82. The pay of the American captain is $175; of the British captain, $100, and of the German captain, $79.75 per month. The American chief engineer receives $150 per month, the British chief engineer, $97.20, and the German chief engineer, $79.75.

This difference in wages is surely a sufficient handicap in itself; but Mr. Bull states that the higher quality of the food and outfit called for by the United States government places the American owner at a further disadvantage, the increased expense in this direction being as great as the increased cost of wages. It should be added, however, that the German captain receives a certain percentage of the gross receipts from freight, which makes the compensation of the German and British captains approximately equal.

Returning to the comparison of the two identical ships owned by Mr. Bull and sailing, one under the American and the other under the British flag, the American ship is under the further handicap that the law requires her to ship seven more men than the British ship. Furthermore, she is never permitted to leave port without a full complement of officers and men, while the British ship may sail short-handed and pick up the balance of her crew at the different ports of call.

Surely the disabilities mentioned above are sufficient in themselves to prove how impossible it is for sea-going ships flying the American flag to compete successfully against the two great maritime nations, Great Britain and Germany, but it is a fact that before the costs of operation come into play, and at the very time that an American-built ship casts off her moorings for her first deep sea voyage, she is already laboring under a heavy handicap represented by the increased cost of construction. For even in our best equipped shipyards the high cost of labor so far offsets our cheap steel that the American-built ship costs more, ton for ton, than does one built in foreign yards. Nor is it at all to the point to quote the case of the Argentine battleships, the contracts for which were secured by American builders largely because they were able to underbid foreign ship yards. The firms which are building these two battleships are in a combine which includes one of the largest steel and armor manufacturing plants in this country, and the builders consequently did not have to figure on the heavy royalties on armor, and the usual profits on the structural and plate steel used in the construction of the hull.

An American traveler, happening to be in Singapore, and observing the total absence of the American flag from that busy haven, had the curiosity to investigate the records of the port and ascertain the true conditions. He found that out of over 20,000 vessels that had cleared during a given period from Singapore, only a single ship flew the American flag.

What are we going to do about it?—

Humor in Business

While the following is not an engineering item, it certainly is worthy of publication anywhere as a fine bit of humor. According to the *American Pressman,* a Cincinnati commission house had sold a bill of goods to a new customer in the interior of Kentucky, who was not rated in the commercial reports. The goods went C. O. D., and a typewritten letter advising the country merchant that the goods had been sent, was mailed to him. The merchant acknowledged the receipt of the letter and raised some highly original objections to the business methods of the commission house. He wrote as follows:

"Jentlemen—I want you to understand sur that I aim't no dam fool when I bort that Bill from that read Headed Agent of yores he tole me that you sent him all the way from cyncynita to git that order. I thot he was lying and i bort all my goods from the jersey and he told me he sole the jersey. now you writes me a printed letter and sez if i send you the munney you will send me the goods. i recon you will most enny durn fool ud do that. i would not mind a Bit sending in the munney and risk gittin the goods but when i recollect how you and yor eagent done me i refuse to do it if you would of treted me right and rit me letters in ritin and not of sent me that newspeper printed letter like I wuz a dam fool and could not read ritin i would a tuck the goods and pade the munny. now i dont wont no more of yore printed letters i wont stan sich from no house i am fifty six year ole the last of next comin jinuwary and the fust man has got to put my back on the ground yit. i may not have as much larnin in gramma as you got but i can whup you or enny uthr dam yanky that wants to try riting me a printed letter."

President William Livingstone, of the Lake Carriers' Association, returned from a five weeks' tour in Europe on Aug. 18.

PROPOSALS FOR DREDGING.—U. S. Engineer office 813 Prospect Ave., S. E., Cleveland, Ohio, September 8, 1910. Sealed proposals for dredging Toledo harbor, Ohio, will be received at this office until 10 o'clock, A. M., October 8, 1910, and then publicly opened. Information on application. John Millis, Col., Engrs.

PROPOSALS FOR CONSTRUCTING Breakwater.—U. S. Engineer Office, 813 Prospect Ave., S. E., Cleveland, Ohio, September 8, 1910. Sealed proposals for constructing breakwater at Fairport, Ohio, will be received at this office until 10 o'clock, A. M., October 8, 1910, and then publicly opened. Information on application. John Millis, Col., Engrs.

PROPOSALS FOR REPAIRING BREAKwater.—United States Engineer office, 813 Prospect avenue S. E., Cleveland, O., Sept. 9, 1910. Sealed proposals for repairing breakwater at Cleveland harbor, O., will be received at this office until 10 o'clock a. m., Oct. 15, 1910, and then publicly opened. Information on application. John Millis. Colonel Engineers.

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has some very important features which are not found in any other water tube boiler.

These features are a fire box, combustion chamber, and horizontal flue pass similar to those of the Scotch Marine Boiler. These features give it a great advantage over other water tube boilers and when combined with the great amount of heating surface which it contains, make it far easier on coal than any other boiler made.

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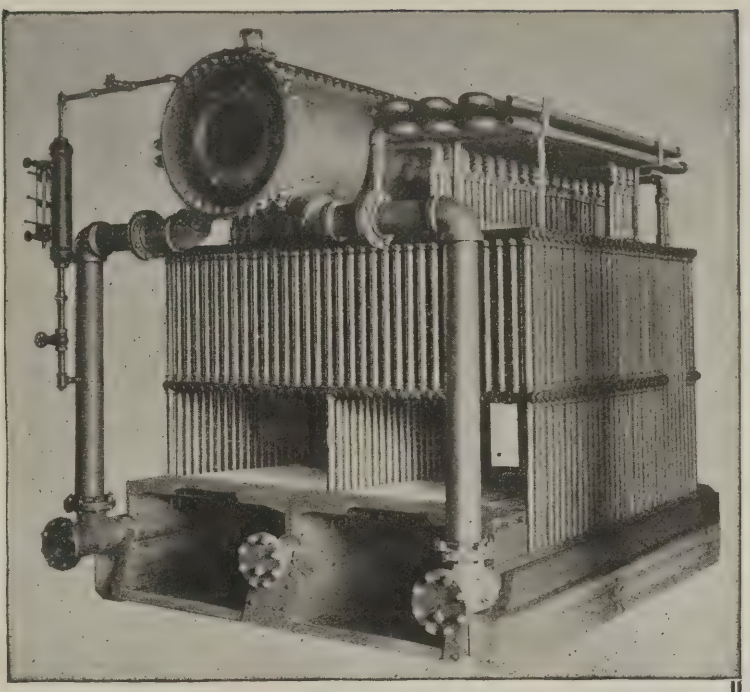

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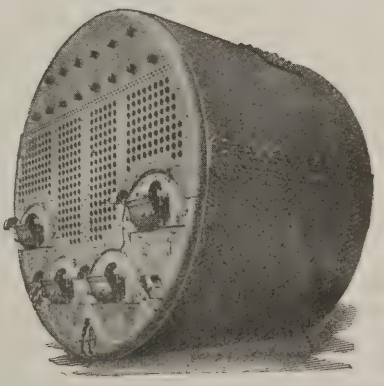

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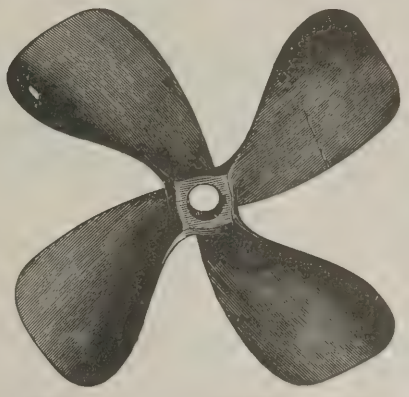

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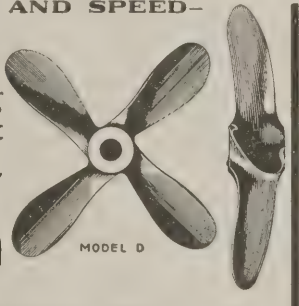

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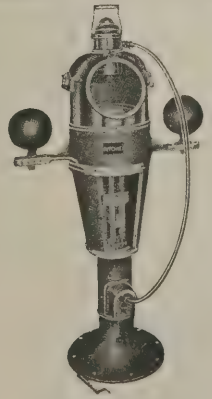

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(Iron or Steel—Hollow Staybolt.)

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BEACONS.

Safety Car Heating & Lighting Co., New York.

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National Tube Co., Pittsburg, Pa.

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Ritchie, E. S., & Sons, Brookline, Mass.

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Boston & Lockport Block Co., E. Boston, Mass.

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Drein, Thos., & Son, Wilmington, Del.

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Clyde Ship Building & Eng'g Co., Port Glasgow, Scotland.
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Detroit Ship Building Co., Detroit, Mich.
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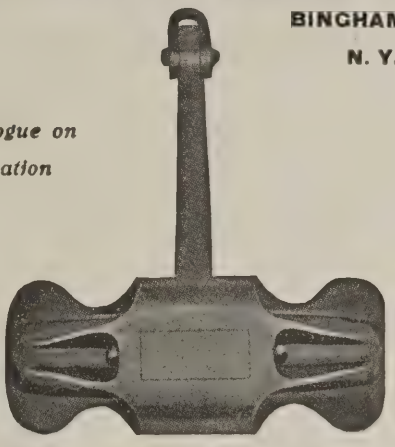

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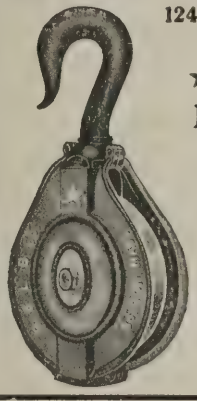

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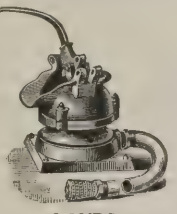

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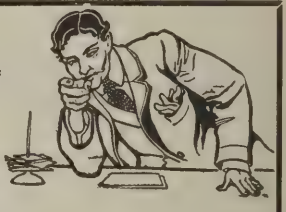

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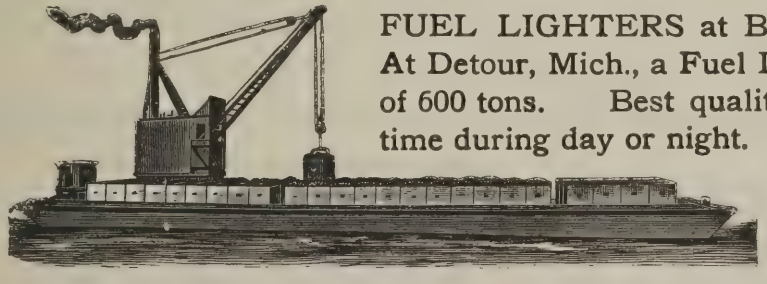

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PROPOSALS FOR DREDGING.—U. S. engineer office, 813 Prospect avenue, S. E., Cleveland, O., Aug. 23, 1910. Sealed proposals for dredging Cleveland Harbor, O., will be received at this office until 10 o'clock, a. m., Sept. 23, 1910, and then publicly opened. Information on application. John Millis, Col. Engrs.

U. S. ENGINEER OFFICE, JONES building, Detroit, Mich., Aug. 25, 1910. Sealed proposals for furnishing about 9,000 tons of rock for the piers at St. Clair Flats canal, Mich.. will be received at this office until 3 p. m.. Sept. 26, 1910, and then publicly opened. Information on application. C. McD. Townsend, Col., Engrs.

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U. S. ENGINEER OFFICE, DULUTH, Minn., Aug. 29, 1910. Sealed proposals for dredging in Marquette Harbor, Mich., will be received here until noon, Sept. 29, 1910, and then publicly opened. Information on application. Graham D. Fitch, Lt. Col. Engrs.

U. S. ENGINEER OFFICE, DULUTH, Minn , Aug. 23, 1910. Sealed proposals for furnishing and placing granite riprap at the upper entrance to Portage Lake canals (Keweenaw waterway), Mich., will be received here until noon, Sept. 23, 1910, and then publicly opened. Information on application. Graham D. Fitch, Lt. Col., Engrs.

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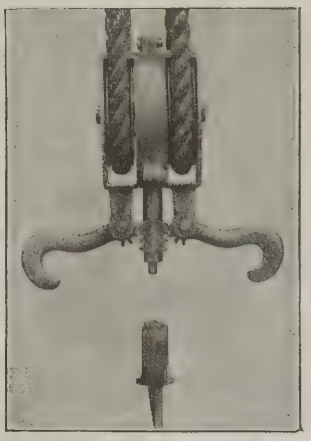

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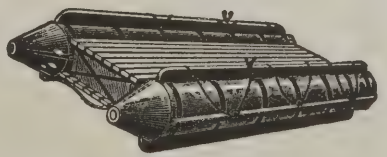

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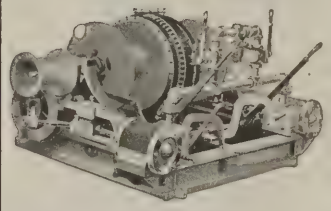

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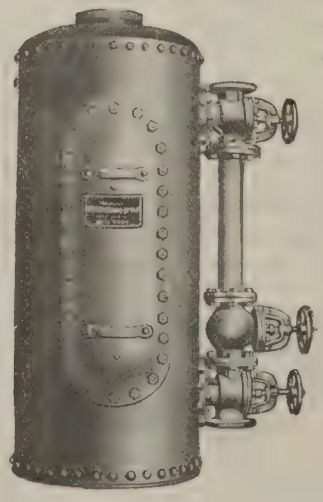

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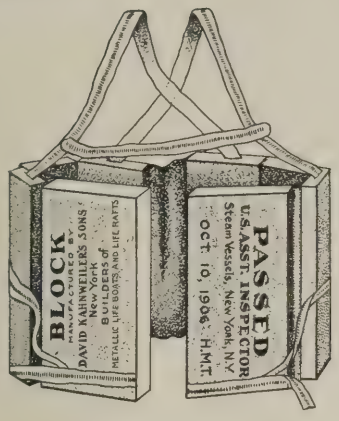

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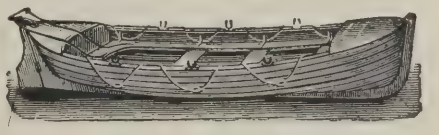

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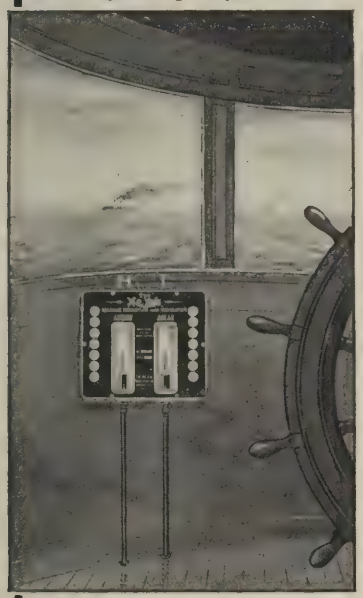

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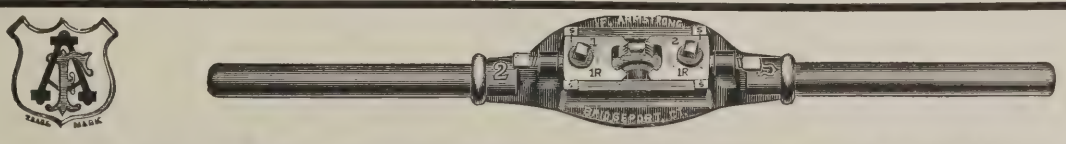

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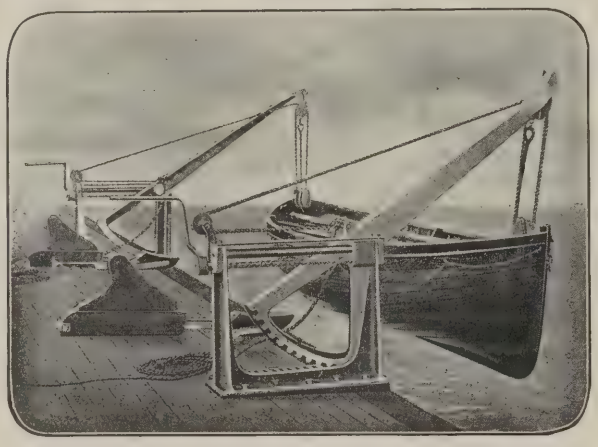

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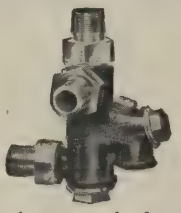

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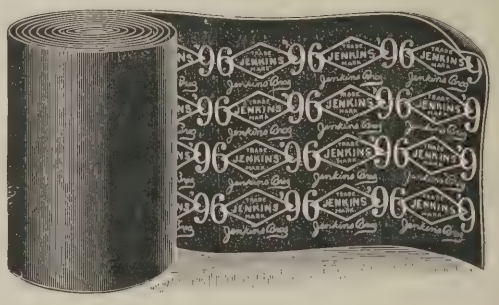

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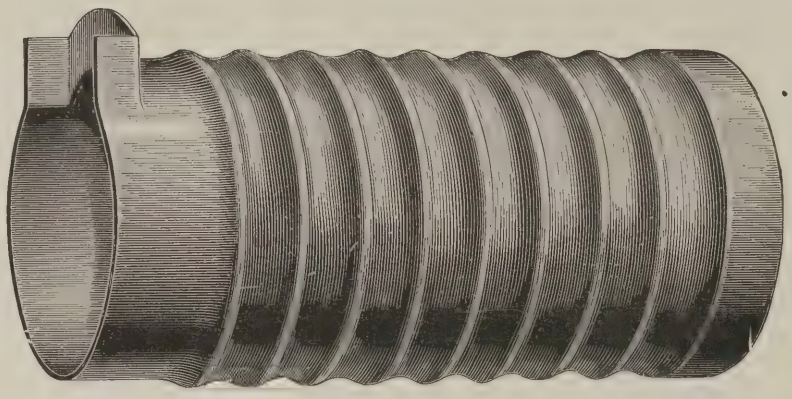

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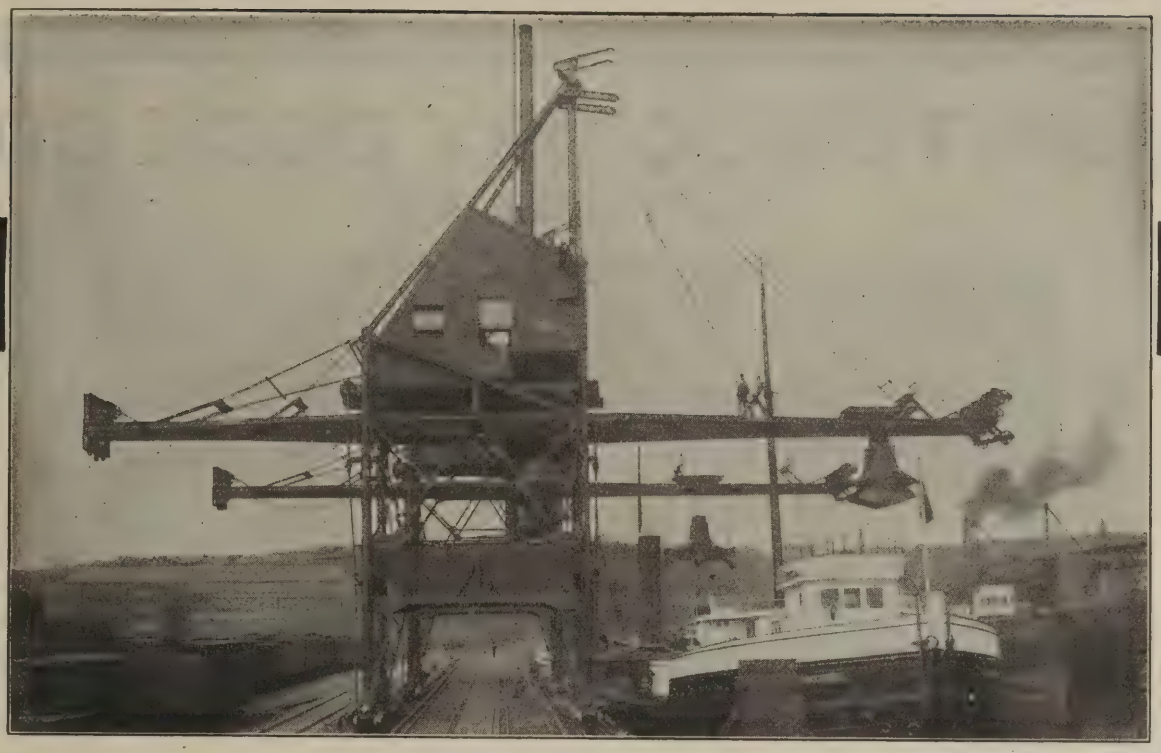

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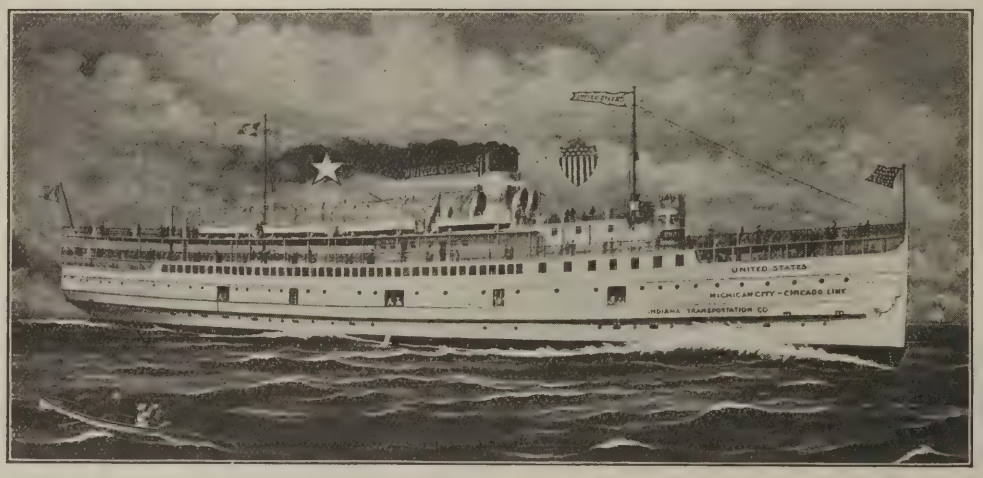

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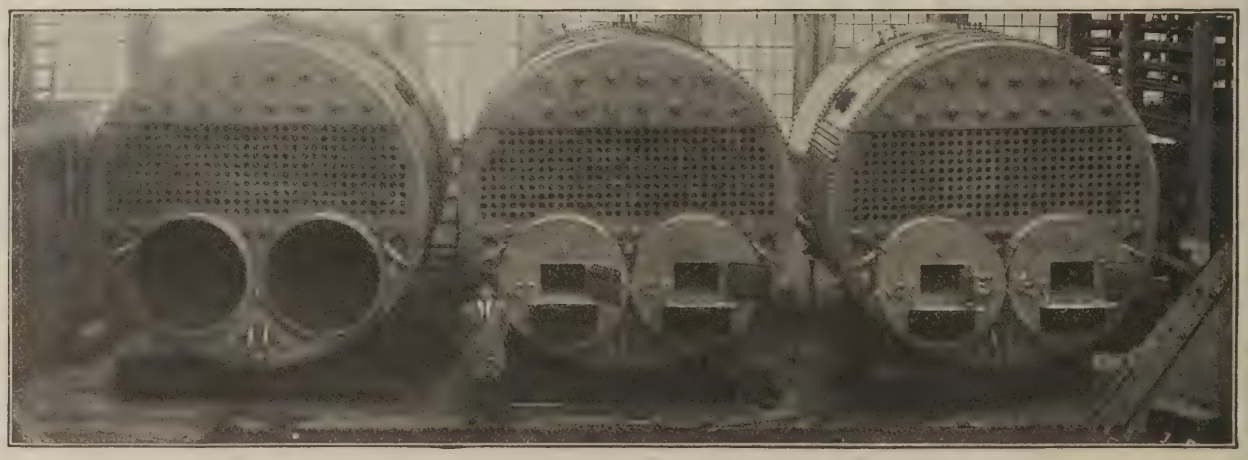

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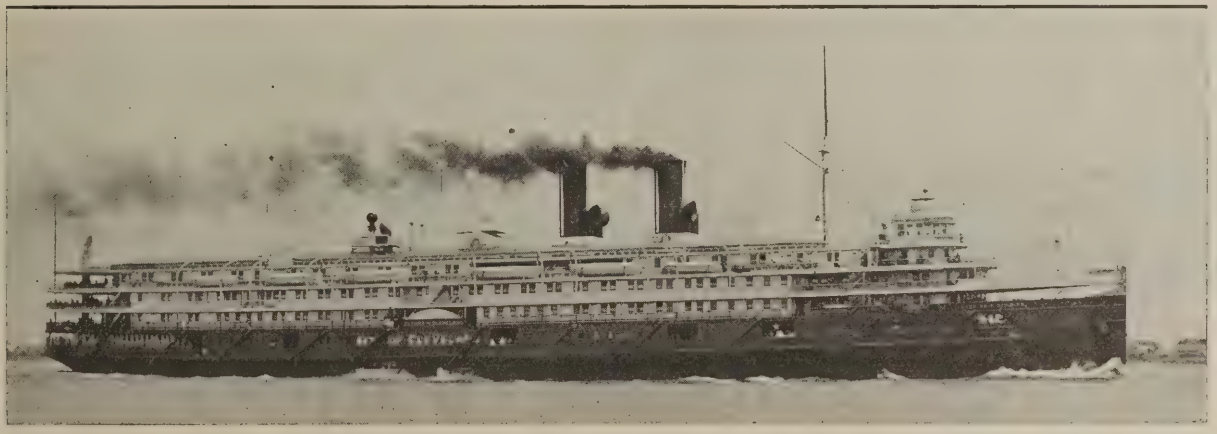

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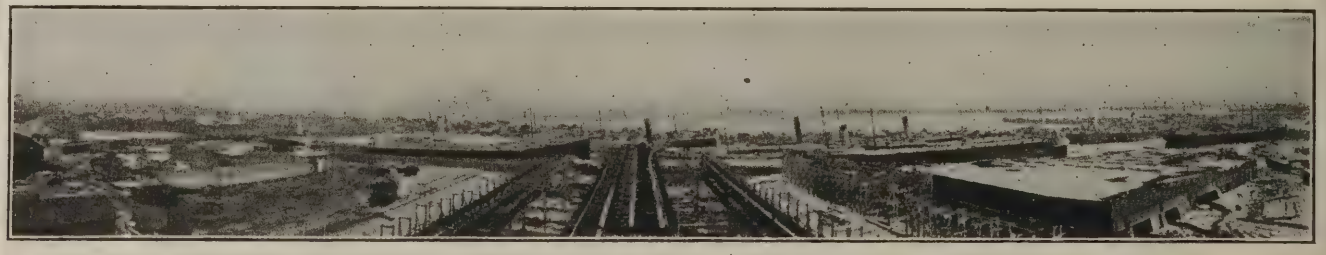

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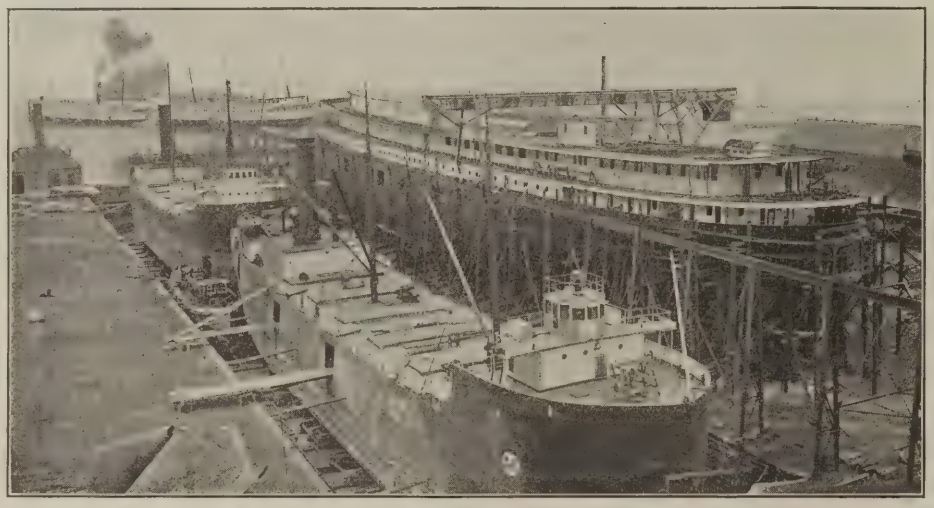

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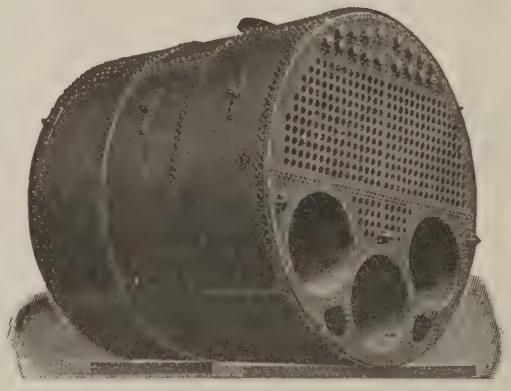

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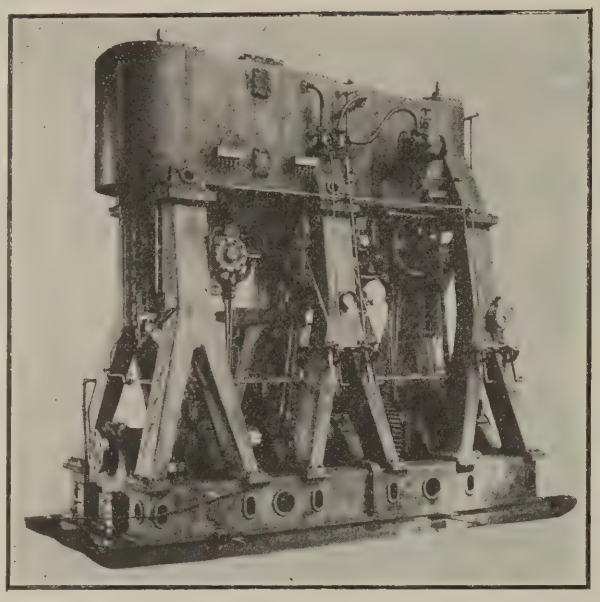

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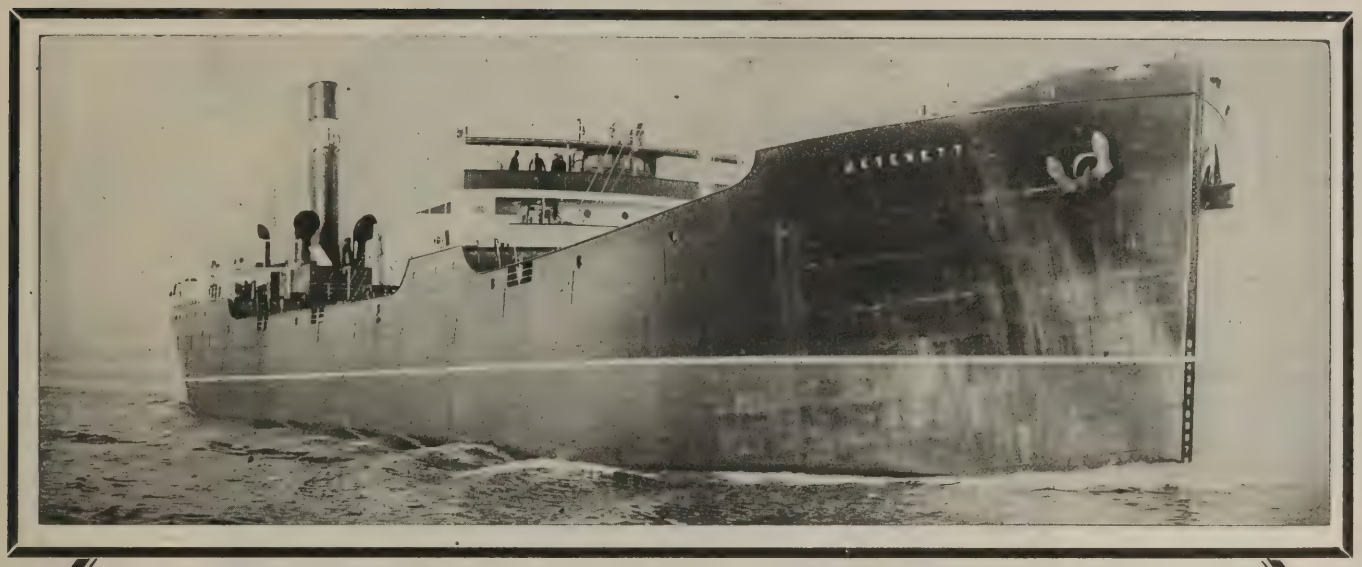

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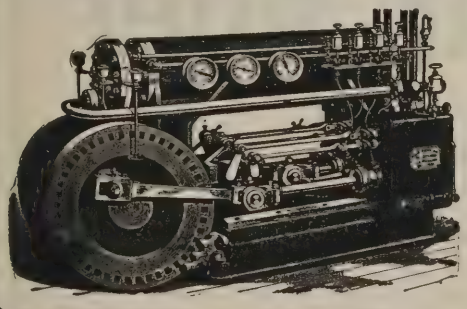

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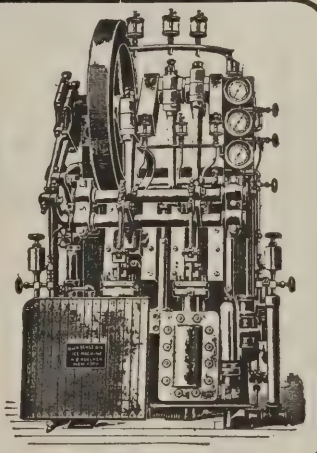

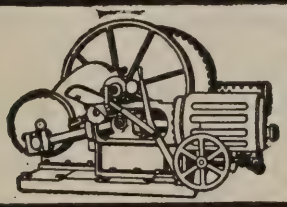

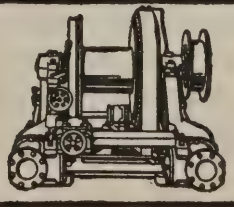

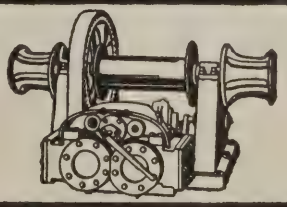

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2736

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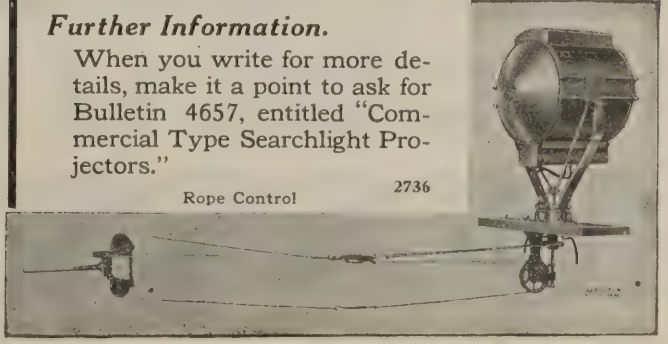

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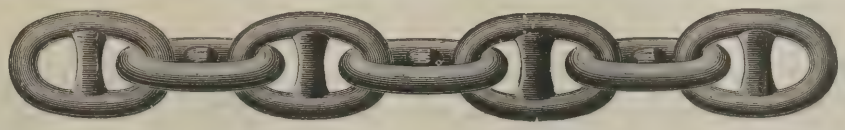

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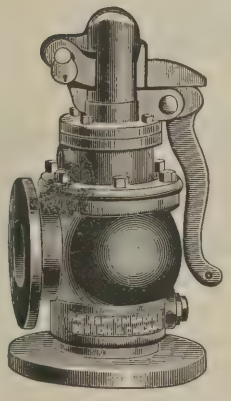

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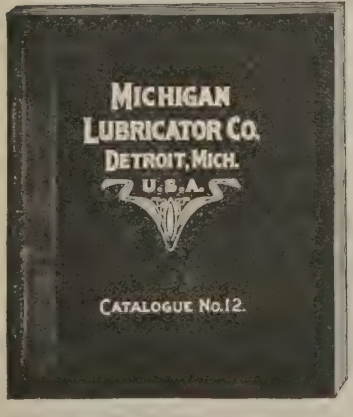

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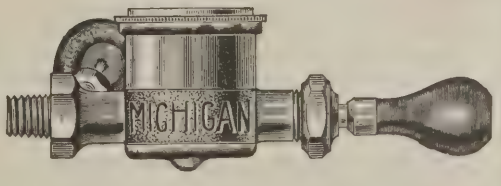

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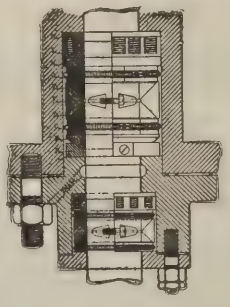

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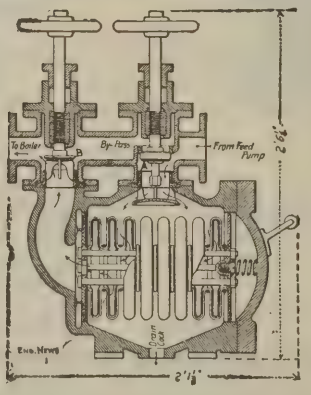

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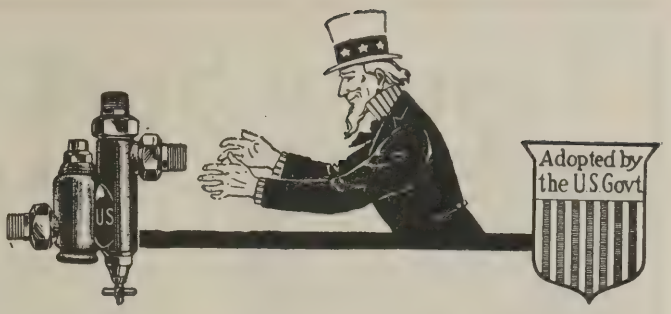

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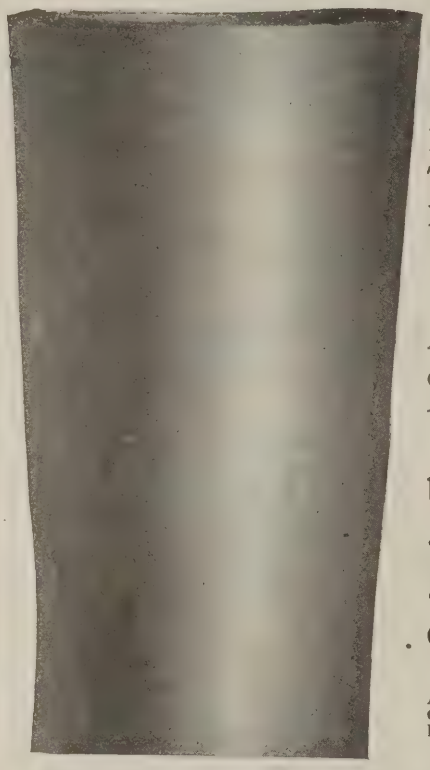

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*This is the fourth of a series of announcements in reference to the qualities of and tests given to SPELLERIZED STEEL BOILER TUBES

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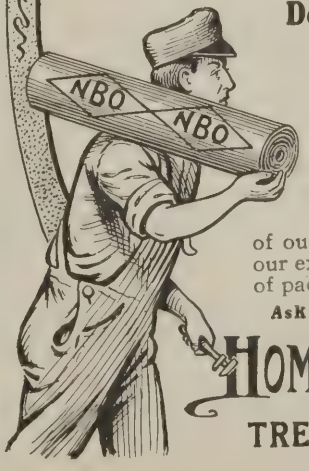

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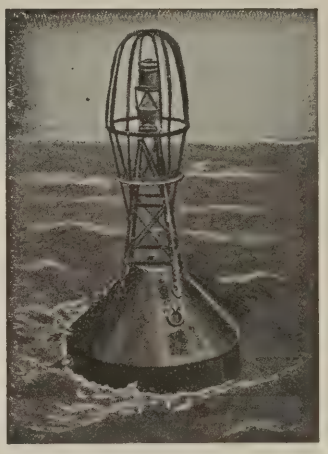

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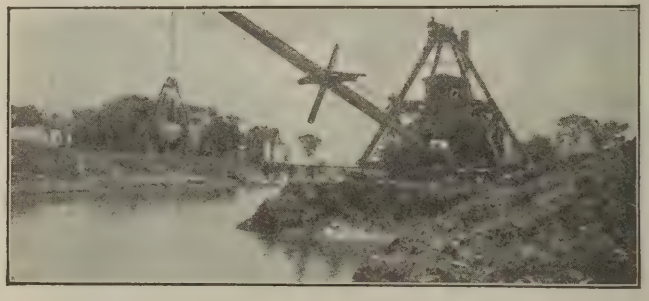

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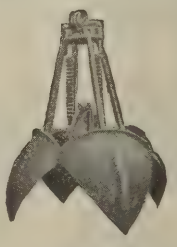

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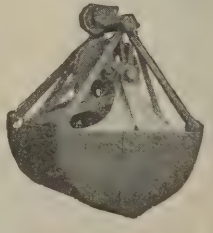

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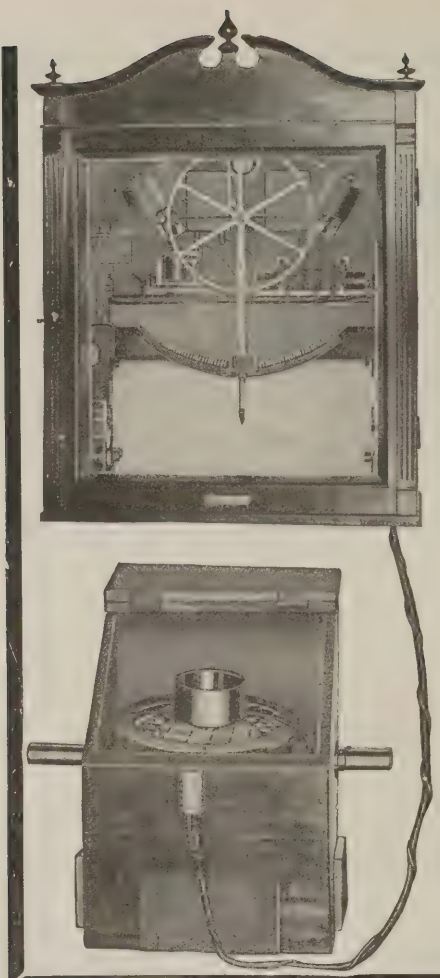

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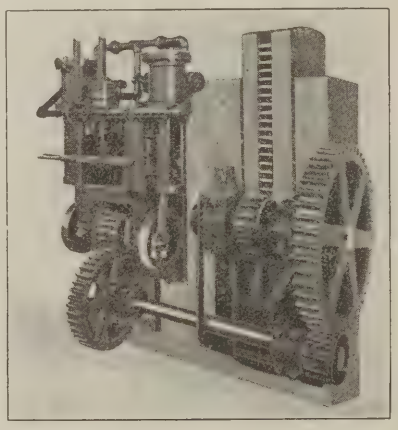

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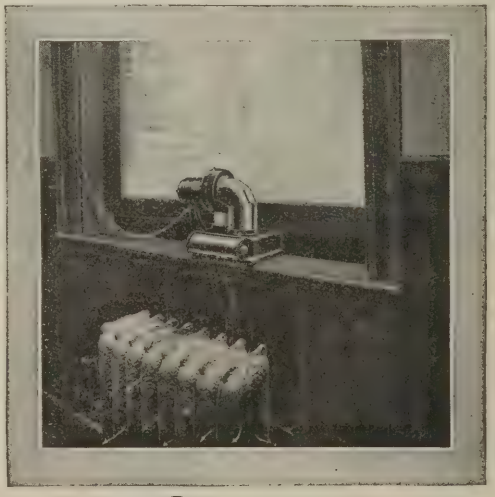

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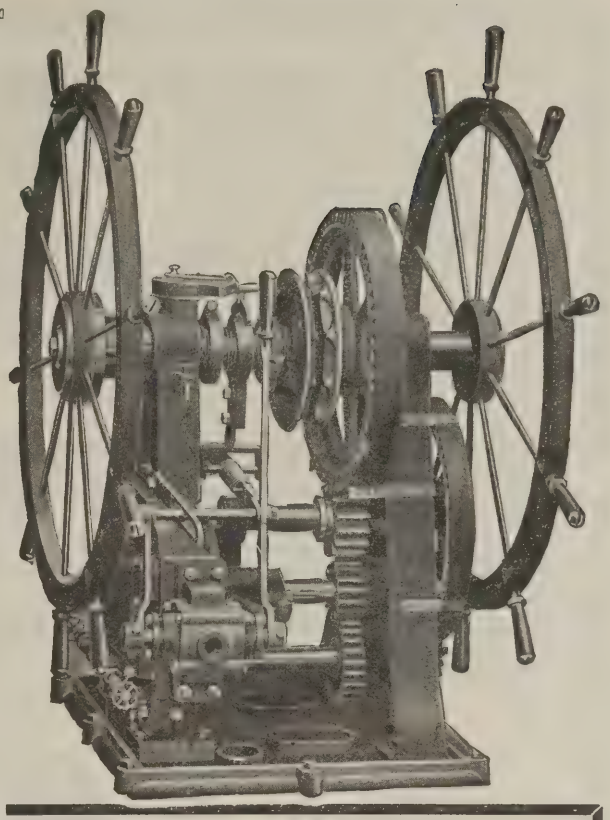

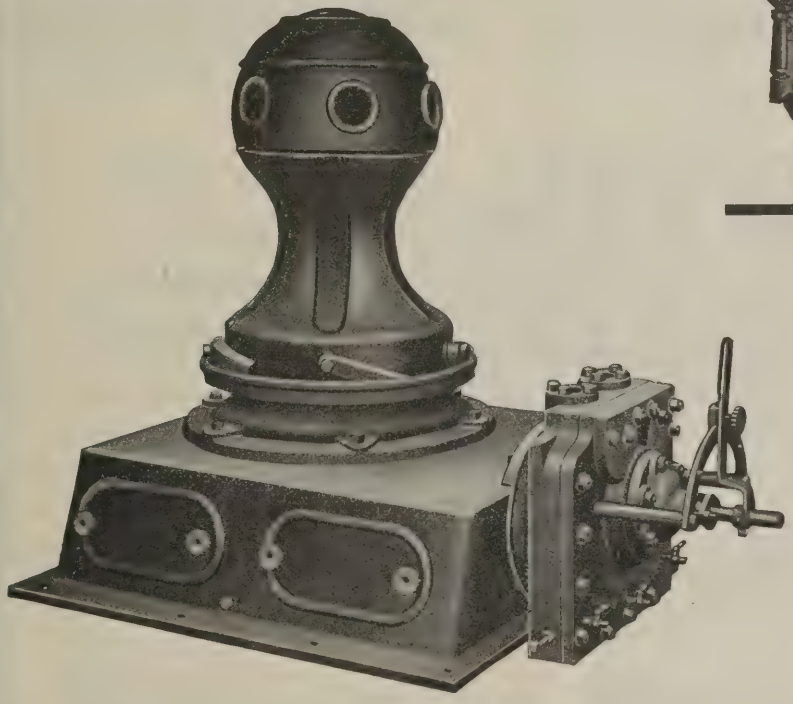

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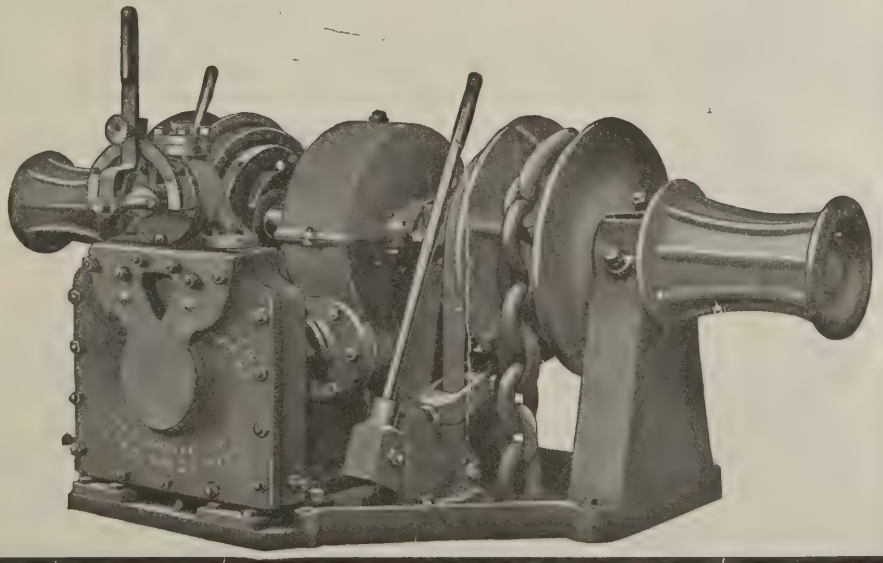

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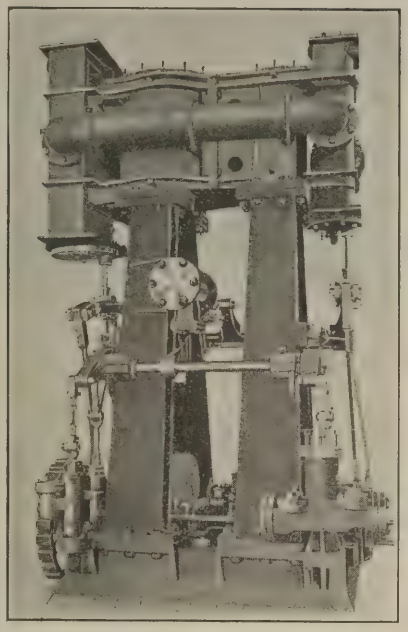

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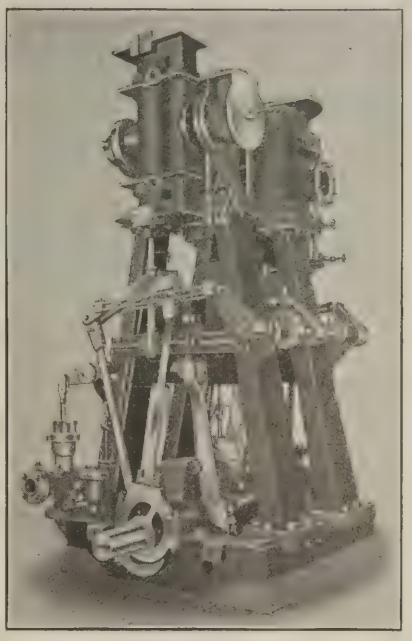

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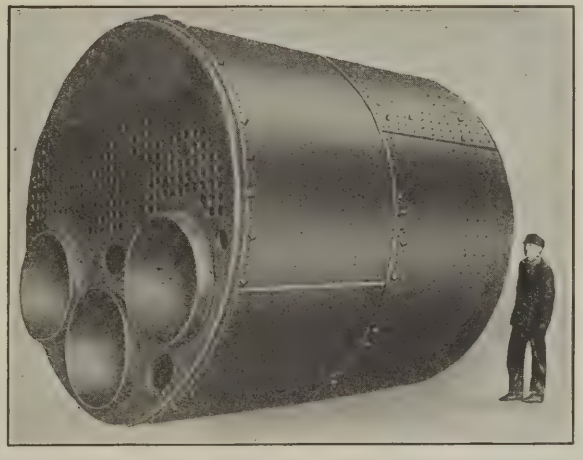

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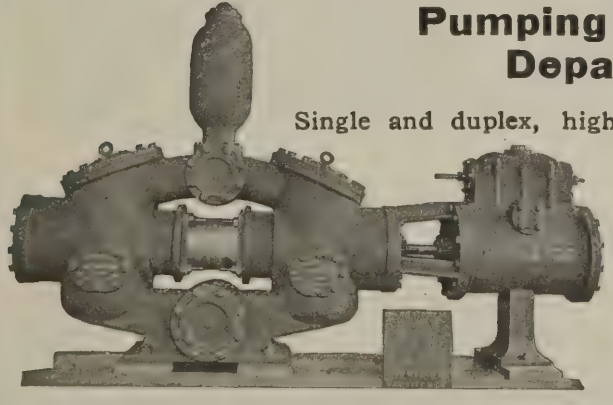

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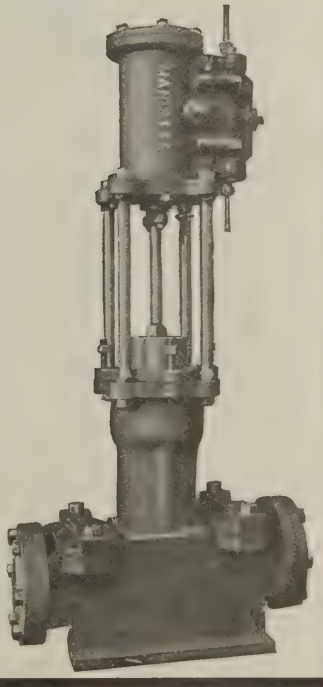

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JAN 4 1927

THE MARINE REVIEW

VOL. 40. CLEVELAND OCTOBER, 1910. NEW YORK No. 10

STRANDING OF PRINCESS MAY

LET us bring to the mind's eye for a moment a map of Alaska. We are concerned just now only with the extreme southern part of this territory, that long, narrow strip of land, beginning about latitude 60 and longitude 140 and extending south along the side of Canada. Accompanying this strip on the west, you see hundreds of islands, known to the world as the wonderfully picturesque Thousand Islands. All of this is counted part of Alaska. In the north end of this tract just described is situated the city of Skagway. Looking south from this city, we see a long, narrow, rough band of water—Lynn Canal, which forms only a part of one of the most beautiful water routes in the world. Thousands of excursionists come to these waters every year to feast on the wild, lovely beauties of the surrounding country. The pleasure seeker, however, forms only a very small

A Graphic Photograph of the Stranding of the Steamer Princess May on Sentinel Rock.

part of the traffic, for commerce is heavy along this route. To get to and from Skagway, it is necessary to follow Lynn Canal. This pass has a width varying from one-half to one mile. The shores are steep and rocky, falling perpendicularly to the water and all along the course are reefs and small islands that are nothing more than huge rocks just barely or not quite reaching the surface of the water. All of this adds much to the picturesqueness, but nothing at all, needless to say, to the safety of travel. The navigable course is very narrow and any slight deviation from it is frought with danger.

A YET MORE STRIKING ILLUSTRATION OF THE PREDICAMENT OF THE PRINCESS MAY, TAKEN AT LOW TIDE. NOTE THE POSITION OF THE SMALLER BOAT.

It was into this body of water that the steamer Princess May, owned by the Canadian Pacific Railroad Co., started from Skagway on its way to Seattle at 12 p. m., Aug. 5. At first, the sky was clear, but shortly a haze settling over the water made it difficult to see far into the night. About two hours after leaving Skagway, neither hearing the fog whistle on the one hand, nor seeing the lighthouse on other until too late, the Princess May bore at full speed onto a reef just north of Sentinel Island. The vessel was running at the rate of 12 knots and came on the rocks with an impetus that drove her up high and dry, raising the bow into the air. The position was a peculiar one. The ship was held on either side so that it could not slip over. At high tide, the hold filled with water. At low tide, the hull was all quite dry. The sides of the reef fall away abruptly 50 ft. and anything happening to loosen the boat would have sunk her at once, for in grinding over the rocks a long jagged tear was made in the single bottom, and it was found that 120 plates were damaged. The crew handled their work quickly, quietly and well and order prevailed. The passengers were taken ashore, suffering nothing more than some discomfort. Signals of distress were promptly answered and the salving tug Santa Cruz, of Seattle, was hastened to the scene of the accident.

The Salving of Princess May.

The salvage feat, as difficult as it was unique, was accomplished by Capt. W. H. Logan, special agent of the London Salvage Association. The first work was to calculate the weight of the vessel to ascertain what sliding ways were required. It was decided to construct ways with a capacity of 11 tons per square foot, which was later reduced to 5 tons per foot. Much of the rock had to be blasted away with dynamite. The steamer Santa Cruz arrived at noon on Aug. 13 and two 10-in. and one 4-in. pumps were placed on board, and anchors laid astern. A 5-ton anchor was laid obliquely from the port side aft, with 250 fathoms, part cable and part wire. Two additional anchors were laid to starboard on a single 250-fathom line. The Santa Cruz made an attempt to pull her off but did not move her.

Before making the attempt, the hull was carefully patched. There was a hole about 50 ft. long and about 18 in. wide on the starboard bow and other holes on the port side about 4 ft. long. Both bilges were stove and there were holes under the engines and boilers. A large number of holes were made amidships by the steamer settling on the rocks at every tide. The majority of the holes were comparatively small, but of irregular shape.

When the patching was complete, it was found that the anchors and hawsers were not heavy enough and that the Santa Cruz could not move the vessel. The British Columbia Salvage Co.'s steamer William Joliffe was accordingly sent for and started north. Heavier anchors were laid out and when the sliding ways were ready, the Santa Cruz and the Joliffe made another attempt to pull the ship off, which was ineffectual and a third pull was taken at midnight on Sept. 2 when the tide was highest and the steamer moved about 60 feet and at noon the following day another haul was made and she slid into deep water, the pumps keeping her afloat.

The wreck was towed to Juneau and thence to Esquimalt, making but little water during the long tow from the north. Within 30 hours after the wreck was floated, one of the heaviest gales of the season occurred and had she been on the reef at the time it would probably have pounded her to pieces.

The Princess May's position on Sentinel island was unique and that there was no break in the hull speaks well for her construction. The floating of the ship was the thirty-second successful salvage job completed by Capt. Logan. Seven bids were submitted on the repairs of the Princess May, the lowest being that of the British Columbia Marine Railway Co., of Esquimalt, to whom the contract has been awarded. This concern agreed to make the repairs according to the specifications drawn up by the surveyors for $85,000, completing the work in 80 days. The tenders were:

		Time, days.
Heffernan Engine Works, Seattle	$131,200*	85
Hall Bros. Marine Railway & Ship Building Co., Winslow, Wash.	120,000*	95
Moran Co., Seattle	125,000*	60
Willamette Iron & Steel Works, Portland, Ore.	105,000*	90
Wallace & Jenkins, Vancouver, B. C.	98,750	76
Victoria Machinery Depot, Victoria, B. C.	94,300	84
British Columbia Marine Railway Co., Victoria, B. C.	85,000	80

*Including duty 25 per cent.

The salvage of the Princess May has cost the underwriters some $35,000 and the repairs will bring the total cost up to about $115,000. The repairs include new plates, frames, beams, propeller bracket and tail shaft.

Princess May is a steel twin screw vessel, 250 ft. long over all, 34 ft. beam, and 18 ft. depth, 1,394 tons gross and 697 tons net. Her engines are of the triple expansion type, developing 250 h. p. She has 82 staterooms, providing separate berths for 164 passengers. She

is known as one of the speediest vessels on Pacific coast.

Princess May's History.

As the Princess May sat there on the rocks, patiently waiting for some one to help her off, had she been able to speak a language understood by mortals, she could have told many interesting and wildly exciting stories. She was built at Newcastle-on-Tyne in 1888 and christened Cass. Since then, her career has been filled with adventures. Never has she been known as a hoodoo ship, however, for she has been very fortunate at all times and though her escapades were quite out of the ordinary, she always came through them without being very badly hurt. Her maiden trip was to the Orient by way of the Suez canal. While proceeding through the canal, the mate manhandled one of the crew of Chinamen, depriving him of his queue. Mutiny arose and the officer were forced to take shelter on the bridge. Their signals of distress were answered by the authorities ashore, but not before the decks ran with blood.

Arrived at Shanghai, it was found that the ship did not pay dividends to her owners and she was tied up. A firm of French adventurers opened negotiations for the purchase of the vessel. The government officials held out for a high price and the would-be purchasers decided to close matters summarily. They procured a captain and loading the ship quietly at night with coal, set out without further ceremony. When at sea, they repainted the ship and changed her name to Ningchow. They were captured in the harbor of Hongkong and brought back to Shanghai.

Later on, as the Hating, while plying her trade in the Orient, she was boarded by Chinese pirates and again her decks were covered with blood, but the pirates were soon repulsed.

For a little time her life was quiet. Then, one year after she was purchased by her present owners, she ran aground on the rocks of Texada Island, north of Vancouver. She was running in a heavy fog and the pilot noticed that she was driving for some huge rocks, just in time to swerve aside enough to save her from them, but not enough to save her from the low reef and at low tide she was left high and dry in very much the same position as that she took on Sentinel Island. The damage to her hull at that time was greater than in this last case, but she was soon floated and repaired, ready for work.

From that time to this, her life has been fairly uneventful. It is expected that it will take three months to put her in working condition once more.

Steamship El Sol's First Trip

THE steamship El Sol, the latest addition to the fleet of the Southern Pacific Co., Atlantic Steamship Lines, operating between New York and New Orleans and between New York and Galveston, arrived at New York at 12:00 m., Sept. 12, after a very satisfactory voyage to Galveston and return.

The El Sol is one of the four vessels authorized by the Southern Pacific company last year and is claimed to be the finest and fastest exclusively freight ship in the world. Her sister ships are the El Mundo, El Oriente and El Occidente, which will be placed in commission within the next three months.

These vessels are of a slightly different type from the ships operated between the Port of New York and Galveston at the present time, and present a very attractive appearance.

The officers' and crew quarters of the El Sol are unusual in their appointments for a freight vessel, and are convenient and handsomely fitted out. She is fitted with the most modern appliances known to marine architecture and is of the following general dimensions: Length, 430 ft.; beam, 53 ft.; depth, 36 ft.; cubic cargo capacity, 425,000 ft.; dead weight cargo carrying capacity, 5,500 tons; mean draught, 25 ft. She will carry 15,000 bales of cotton.

The El Sol is propelled by a single screw, which is driven by a vertical inverted triple-expansion surface condensing engine of the most modern type with cylinders 34½, 57 and 96 in., with a stroke of 60 in., and is capable of indicating 6,000 h. p. at full speed. The boilers, of which there are three in number, are of the double-ended Scotch marine type with four Morrison suspension furnaces in each end, and are built for a working pressure of 200 lbs. per sq. in. The boilers are operated under Howden's heated system of forced draft. The vessel was built by the Newport News Shipbuilding & Dry Dock Co., at Newport News, Va.

The first voyage of the El Sol was in the nature of an owner's trial and demonstrates her to be one of the most modern and efficient vessels on the Atlantic coast. She left New York at 12:30 p. m., August 27, and despite the fact that she ecountered hurricane weather and considerable head current, she arrived at Galveston at 7:40 p. m., Sept. 1, 12 hours ahead of schedule. On the return trip, the vessel sailed from Galveston at 7:30 p. m., Sept. 7. and arrived at New York at 12:00 m., Sept. 12, 18 hours ahead of schedule. Her average speed for the round trip, from Bar to Bar, was 16.108 knots. The fuel consumption both southbound and northbound was at the rate of 1.443 lbs. of coal per i. h. p. The vessel carried a full cargo of miscellaneous merchandise in each direction.

Suction Dredge for Honolulu

The Standard American Dredging Co., of San Francisco, is having a suction dredge built by the St. Johns Ship Building Co., of St. Johns, Ore., for use in Honolulu. The dredge is 135 ft. long, with a 40-ft. beam and a depth of 12½ ft., with a 20-in. suction pipe. Power will be supplied by Babcock & Wilcox water tube boilers and Allis Chalmers steam turbines. All the machinery will be installed in Honolulu, the hull being towed across the Pacific, from Portland. The dredge was designed by the Standard American Dredging Co., and the hull is being built and the machinery installed under the supervision of Wm. S. Brusstar Jr., of San Francisco.

Very little work is being done by any of the ship building firms in Portland at the present time, either in the repair line or in new work. The Port of Portland is in need of more tow boats and plans and estimates are being considered for a stern-wheel boat for the river service.

But one bid has been received by the government engineers for the 600,000 tons of rock, needed to finish the jetty now being built by the government at the mouth of the Columbia river. The bid was made by the Columbia Contract Co., and totalled $681,750, and will probably be accepted.

The Port of Astoria is awaiting the final data on the survey of the harbor from the war department, before taking action toward the improvement of the harbor.

Destroyer Paulding's Trial

The torpedo boat destroyer Paulding, built by the Bath Iron Works, Bath, Me., underwent her trial recently, the results being tabulated herewith:

	16-knot.	25-knot.	4-hour.
Duration of trial, hours.	12	12	4
Mean revs. per minute.	368.4	623	903
Speed in knots	15.9	25.25	32.80
Turbine horsepower ...	1,465	7,284	17,000
Water per hour, turbines and aux., lbs.....	30,932	105,515	218,414
Water per turbine H. P. per hour, lbs.....	21.12	14.48	12.85

Greiling Bros., Green Bay, Wis., were the lowest bidders for building reinforced concrete caissons and pile pier at Racine, Wis. Their bid was $149,468.

Passenger Steamer La Touche

THE great and rapidly increasing trade between Puget Sound and Alaska ports is no better indicated than by the vessels being built and added to the fleet of carriers operating between these points.

Another important addition has been made by the completion of the freight and passenger steamer La Touche for the Alaska Steamship Co., Seattle. La Touche is a single screw, steel vessel, 250 ft. over all length, 41 ft. beam, 19 ft. 3 in. depth. Although built primarily as a general freight carrier, there are accommodations for fifteen first-class passengers in a house on the poop deck, and on the starboard side under the poop are accommodations for seventy-five steerage passengers. The latter quarters are fitted much better than the average steerage compartments.

Apart from her passenger accommodations, La Touche is very similar in design to the steamships Riverside and Stanley Dollar, operated by the Robert Dollar Co., of San Francisco. The gross tonnage of the La Touche and Stanley is 1,838 and 955 net. Special care has been taken in providing equipment for handling freight easily. All machinery is aft under the poop deck, with quarters for the officers and crew on the port side under the poop and under the forecastle deck. Wireless equipment is also provided for. The cargo hatches, 16 ft. 6 in. by 32 ft., are two. The two steel masts are each provided with two five-ton derricks and one 20-ton derrick. Winches for handling cargo are installed on the extensions of the forecastle and poop decks. Power is supplied by one vertical triple-expansion engine, designed and built by Moran Co., with cylinders 17, 28 and 47½ in., with a stroke of 36 in. and about 1,000 i. h. p. Steam is generated by two single-ended boilers, 12 ft. diameter and 10 ft. 9 in. long, fitted for oil fuel.

The building of La Touche was a record for the Pacific coast. The contract for her construction was let Feb. 11, 1910; she was launched Aug. 25, and made her trial trip and was accepted by the Alaska Steamship Co. on Sept. 8. On her trial, La Touche developed an average speed of 12 knots, two knots above that called for in the builders' contract.

When launched on Aug. 25, the ship was nearly complete, with all machinery in position. She was christened by Jennette Lawrence Young, the ten-year old daughter of J. H. Young, president of the Alaska Steamship Co. After the launching, a lunch was served by the builder, at which a large number of guests were present.

Moran Co. have been extremely busy for the past six months, having completed the Kulshan, as noted in THE MARINE REVIEW for August, the La Touche, and having under construction two submarine torpedo boats, the Pickerel and Skate, besides minor repairs to a number of ships. About 400 men are at present employed in all departments.

PASSENGER STEAMER LA TOUCHE, OF THE ALASKA STEAMSHIP CO.'S FLEET.

Producer Gas Yacht

The first yacht having producer gas engines for propulsion, to be built in Scotland, is now on the stocks of Messrs. MacLaren Bros., yacht builders and motor engineers, Dumbarton, and will be launched early in October. It is to the order of Messrs. Mavor and Coulson, electrical engineers, Glasgow, whose H. A. Mavor is well known to naval architects and engineers the world over for his study of and proposals in connection with turbo-electric propulsion of vessels, and is intended to be used for experimental work designed to assist in solving this problem. Built of steel, the vessel is 54 ft. long by 10 ft. 6 in. beam, and while having good living accommodation, the feature of the little craft will be her engine room and suction-gas producer plant, which are grouped aft, and entirely isolated from the living quarters. It is understood that the engine will be of vertical four-cylinder design, of at least 50 h. p., but facts as to the machinery details are not yet available.

Leviathan American Coal Carrier

BY the courtesy of Sir Raylton Dixon & Co., Ltd., we are able to reproduce a photograph, showing the launch during August of what is said to be the largest commercial coal carrying ship afloat.

She was built at the firm's Middlesbrough yard to the order of the Havana Coal Co., and her carrying capacity will be 8,500 tons. She is named the Berwindmoor, and is the first of a fleet of leviathan coal carriers to run between Chesapeake ports and Cuba. The Berwindmoor is described as the latest creation as a self trimming coal steamer, and she has been designed by Messrs. W. Esplen & Sons, of Liverpool. The vessel is a steel-screw steamer, built on the Harroway-Dixon cantilever principle. Her dimensions are: Length, 425 ft.; beam, 54 ft.; depth, 29 ft. The great carrying capacity of the vessel, namely, 8,500 tons, will be provided for in handling by the latest types of plant. There are to be five holds with large hatchways, 33 ft. by 21 ft., which will afford free play to any kind of grab or bucket from any part of the holds. It will be possible to load the vessel in ten hours, and to discharge her in 16 working hours. She will have eight winches. The engines are triple-expansion, 28 in., 46 in. and 77 in., and are calculated to give a loaded speed of 11½ knots. Special attention has been given throughout to the engine work on account of the tropical trade, in which the Berwindmoor will be engaged, and she will be equipped with Contraflo condensers and evaporators. In all other respects the vessel will be thoroughly up-to-date. She will be lighted throughout with electricity and will carry a wireless installation on the De Forrest system, as well as a submarine signalling equipment.

Bids will be opened at noon, Oct. 31, by the Department of Marine and Fisheries, Ottawa, Can., for the construction of a twin-screw, steel lighthouse tender for the Pacific coast, to be delivered at Victoria, B. C. The steamer will be 200 ft. long, 38 ft. beam and 11 ft. 6 in. deep.

COLLIER BERWINDMOOR FOR THE HAVANA COAL CO.

A Mosquito-Proof Steamer

The first ocean-going mosquito-proof vessel, built for the African trade, is now in commission. Fittings are provided against the intrusion of mosquitoes in the quarters of both passengers and crew. All doorways, side port openings, windows, skylights, ventilators and passages have been provided with mosquito-proof, close-mesh gauze coverings, which, while allowing the necessary ventilation, prevent the admission of the disease-bearing mosquito. Great care has been given to the convenient placing of these fittings to make them readily adjustable. The vessel is 262 ft. long, has 38 ft. beam, and is 18 ft. 3 in. in depth. The plan of arrangement adopted was recommended by Prof. Major Ronald Ross, C. B., a recognized malarial expert, whose malarial recommendations are very generally known throughout the tropics.

Steamer Willie Irving

The following account of the Alaska steamer Willie Irving was prepared for THE MARINE REVIEW by Joseph Supple, of Portland, Ore. At the Supple yards have been built a large number of wooden ships in service on the north Pacific coast and many of the stern wheelers that have contributed their share to the early history and development of Alaska. Because of the lack of transportation facilities other than men's backs and dog sleds, it was a problem to transport provisions and tools, to say nothing of anything of the size of an 80-foot boat. The history of the Willie Irving, the first of the remarkable Alaskan fleet, illustrates the difficulties confronting the builders and how they were overcome. From Dawson to White Horse, the distance is 460 miles through a chain of lakes and rivers, which include some of the most treacherous inland waters known. The Irving's record of 7 days between Dawson and White Horse meant an average of nearly 65 miles per day. Chilkoot Pass, from Skagway to Lake Bennett, is some 40 miles long.—EDITOR.

THE opening and discovery of the gold fields in the vast wilds of Alaska, where the waterways offered the sole means of communication, created an immediate demand for river craft, greater than any other event of the century. There were no manufacturing establishments in Alaska then and but few supplies could be obtained there at any price. Everything that was taken into Alaska had to be prepared as nearly complete as possible and so packed that it could be transported by men and dogs on the trails across the hills over the ice and snow.

In 1898 when the rush to Dawson was at its height, I was commissioned to build a stern wheel boat for use on Lakes Bennett and Atlin, and on the Yukon river above the White Horse rapids. A trail had been built across the divide at Skagway, and at this time it afforded the only entrance to lower Alaska over which any considerable amount of material could be packed. The boat was called Willie Irving in honor of a nephew of Capt. E. W. Spencer, who gave the order.

The general dimensions were, length 80 ft., beam 20 ft., and draught 3 ft. Power was supplied by a pair of 7 x 28 in. engines and water tube boiler and she was propelled by a stern paddle wheel. The engines were built principally of cast steel and wrought iron to carry a very high steam pressure. One of the contract conditions was that no piece used in her construction be over 20 ft. long and that no part or package except the wheel shaft be too heavy for two men to take over the trail. Everything was to be made as complete as possible to reduce the labor of reassembling to a minimum. The engines, boilers, and pumps were built by the Marine Iron Works of Chicago. I still have a letter written by Manager Nourse of that company, dated Feb. 14, 1899, in which he says. "The Willie Irving is unquestionably a most successful boat; one of the most satisfactory of her size ever built and yet one which you and I know taxed the ingenuity of all concerned, necessitating the most painstaking care as to details. She has proven a phenomenal bread winner (perhaps I should say diamond winner), even among the big earners of the upper Yukon. As a matter of fact, the transporting of such a boat in small sections over the trail to the lakes is in itself a remarkable feat, even though she should have proven a very ordinary craft when completed."

In building her hull, I had to use all the methods I knew of and to employ many new devices, to lessen weights, increase strength of construction, and permit the use of such short materials. The following were some of the principal items in her bill of material:

Frames, bent oak, 2½ in. x 2½ in., 20 in. on centers; keel, built of 1½ in. x 8 in.; floors, 2½ in. x 2½ in.; knuckle, 2½ in. x 5 in.; decking (main deck) 1 in. x 4 in., tongued and grooved; transom, 2 in. x 12 in.; shelf piece, 2½ in. x 2½ in.; fantail, 4½ in. x 2½ in.; deck beams, 1¼ in. x 2½ in.; frame for freight house, pilot house, and texas, 1 in. x 2½ in.; siding and decking for superstructure, ⅝ in. cedar, tongued and grooved.

Keelsons were built up of 1¼ in. stuff, using two planks for the side and bilge keelsons and three for the center keelsons, laid together with broken joints and bolted through and through with carriage bolts. All the timbers running fore and aft in her hull were made continuous by butt strapping. These timbers were all shipped in sections not over 20 ft. in length.

It was the captain's intention on leaving to use the bent oak frames as runners for temporary sleds to carry the materials over the snow on the trail, loading and unloading the timber as conditions demanded. Not one piece or package containing the materials for this boat and her machinery and equipment was too heavy for two men to transport, with the exception of the wheel shaft, which was hollow and weighing about 400 lb. When the shipment reached Skagway, the captain found that a wagon road was about completed through the pass and on to the lakes. He hurried the boat materials to the toll gate and waited for the road to be opened. He paid on the timber for the Irving the first toll money collected on that famous pass, and reached Lake Bennett in due time, where she was rapidly assembled and put into service.

After making a few trips on the lakes, the impulse to join the rush to Dawson was too strong to be resisted and despite the warnings of the dangers of White Horse rapids and Miles canon, the captain took her to Dawson. She was the first steamer to pass down the river and was one of the first boats put into service on the Yukon above Dawson. Before reaching Dawson, the Irving was sold. During the remainder of the season, she made two trips to White Horse and return, earning, it is stated, over $128,000. The Irving held the speed record on the Dawson run, making an average time of seven days from Dawson to White Horse, her high pressure engine being largely responsible for her good running. Her closest competitors made the trip in nine days. After the season closed, she was dismantled and put ashore for winter, the boiler being used to furnish steam heat for a building in Dawson.

The second and third seasons saw a continuation of her success and splendid service until wrecked the third year. While I have no definite figures available, as far as records show, this little 80-foot steamer during her short life earned over $250,000, a feat so far as I know, without parallel in the history of river navigation.

Pacific Coast Casualties

For a period of about four weeks, beginning with the latter part of July and extending on into August, there has been among the boats plying Pacific coast waters, a succession of mishaps, collisions, and wrecks. In nearly every case the trouble has been attributed to fog. This series of accidents, greater in number than any other for the same length of time, seems to be rather a question for the psychologist in view of the fact that the fogs of this year have been no worse than those of other years. Be the reason what it may, however, a hard fact remains to be faced by the insurance companies—the losses they will have to cover are unusually and disturbingly heavy. Another exceptional feature in this series of marine casualties is the fact that in it there has been almost no loss of life. Even where conditions seemed hopeless and the vessel proved a total

loss, human life was sacrificed in only one case.

A list of the more recent casualties will suffice to give some idea of what the Pacific shipping has suffered. After having groped about for several days in dense fogs around St. Paul Island, Bering Sea, the United States revenue cutter Perry struck a reef off Point Tonki. The crew worked earnestly to free the ship, but within a few hours were forced to transfer to the Tahoma, which had been summoned by wireless. In spite of all that could be done for her, the Perry pounded about on the rocks until completely demolished.

The gasoline schooner Helen Johnston left Seattle in April to trade with Eskimos in north Alaskan waters. Many narrow escapes dotted her log through the spring and early summer, but she continued her work until recently a heavy storm drove her on the rocks off Point Hope and ship and cargo were total losses. The shore at the point of the wreck is barren and the crew were fortunate in getting away with their lives.

Schooner James Rolph, owned by Hind, Rolph & Co., stranded during a heavy fog Aug. 2, near Point San Pedro. She was bound for the Hawaiian Islands. All efforts to release her have been abandoned.

Helga, a British wooden barkentine of 1,254 tons, built in Norway in 1892, grounded on the Island of Kauai, Hawaii, Aug. 11, was abandoned by her crew and is reported fast going to pieces.

Schooner Annie E. Smale, from Australia, with coal for San Francisco, went ashore in a dense fog and is a complete loss. The coal was insured but not the ship. The crew were picked up by the steamer M. F. Plant.

Near Port Townsend, Wash., with the weather bright and clear, but probably thrown from her course by a strong tide, steamer Dode struck a reef in such a way as to make it impossible to save her. She has been abandoned.

Besides these total losses, there have been a great many other casualties more or less serious. On Aug. 5, Princess May, a passenger steamer, owned by the Canadian Pacific railroad, struck a reef at north Sentinel Island. Her eighty passengers and crew of sixty-eight were all uninjured. It was at first supposed that it would be an easy matter to release her, but her floating proved a matter of considerable difficulty.

Aug. 2, steamer Chippewa collided with the steamer Albion off West Point, near Seattle. Though the Albion was badly damaged, her passengers were uninjured and were taken off by the Chippewa, which then beached the Albion. An Aug. 10, the Chippewa, while running in a thick fog, struck Davidson's reef and was so severely damaged that she will be off her route for some little time.

U. S. Cruiser Chattanooga was towed into Bremerton from the Hawaiian Islands by the fleet collier Prometheus. She was disabled in Hawaiian waters by the breaking of her propeller.

Japanese steamer Awa Maru, shortly after her departure for the Orient, broke her main steam pipe and found it necessary to stop at Victoria, B. C., for repairs.

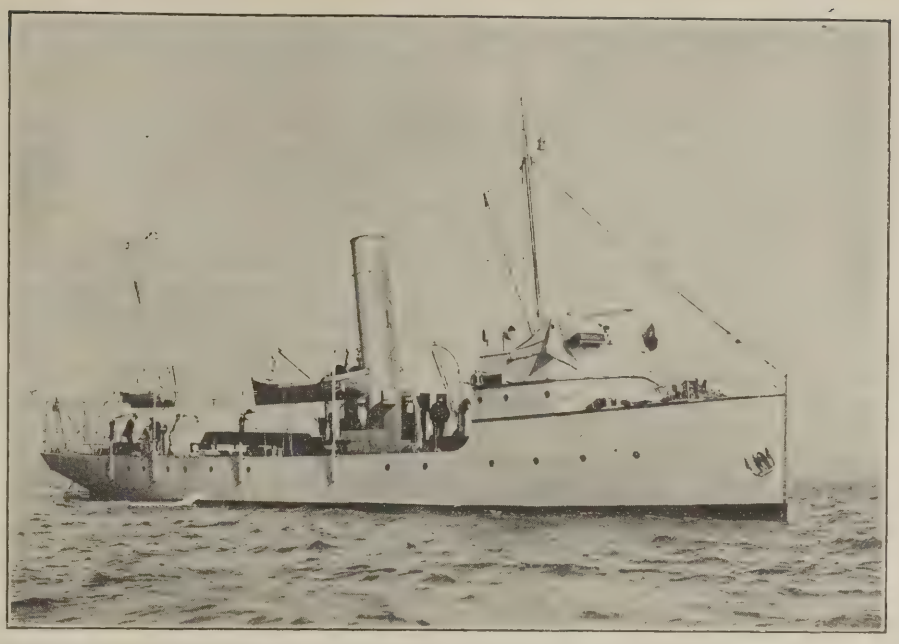
Reporting herself only slightly damaged, the excursion steamer Sechelt, which went ashore in the Narrows, near Vancouver, B. C., was floated Aug. 10. The passengers were badly shaken, but none of them injured.

Steamer Newport, while bound up the Columbia river, struck the beach on July 29 and was floated only with considerable difficulty.

The Potter, carrying passengers on the Columbia river, collided with the steamer Oklahoma, which was towing a barge. A 40-ft. hole was torn in the side of the Potter.

The British steamer Riverdale, bound for China, struck in Madison Bridge Passage at Portland, July 28. She was not seriously damaged.

Of those aboard the vessels, above mentioned, none were killed or injured. The crew of the steam schooner Phoenix, whose boilers blew up at sea, Aug. 10, about ten miles north of Point Arena lighthouse off the Mendacino coast, were not so fortunate. The chief engineer, second mate, and two firemen were either killed outright or died soon after the accident from injuries sustained.



MINE-LAYING STEAMER FOR THE PORTUGUESE NAVY.

Mine Laying and Torpedo Regulation Vessel

Messrs. J. I. Thornycroft & Co., Southampton, have built an interesting vessel for the Portuguese navy, a twin-screw steamer specially designed for laying submarine mines and testing and regulating Whitehead torpedoes. Her principal dimensions are: Length over all, 117 ft.; breadth, molded, 19 ft. 6 in.; depth, molded, 11 ft.; draught, 6 ft. 9 in., and her speed is 12½ knots.

For mining purposes the vessel is equipped with shearlegs at the stern worked by a combined electric and hand winch. For torpedo-testing and regulating, the vessel is provided with a revolving 18-in. torpedo-tube amidships, and at the break of the forecastle with two torpedo-cages (or skeleton tubes made of angle bars, etc.) which can be lowered into the water by means of special davits, so that the torpedoes can be started under water by means of their own power on pulling a starting lever.

There is a steam steering gear controlled from the bridge and a hand gear aft. Electric lighting is fitted throughout, and a search-light on a portable stand on the bridge.

The bridge is placed at the break of the forecastle, and the front part of it forms a breakwater.

The vessel is equipped with three small boats, viz., one Thornycroft 20-ft. motor launch, one 20-ft. life boat, and one 12-ft. dinghy.

The machinery consists of two sets of tri-compound surface-condensing engines, and one Thornycroft water-tube boiler working under natural draft.

METHODS OF OBSERVING WAVES AT SEA

THE hydrographic office is endeavoring to get new and carefully made observations of waves at sea and has prepared a blank for distribution among navigators. The hydrographic office says that if 100 skillful ocean navigators would each furnish 10 sets of wave observations to the hydrographic office, the mass of information thus afforded would give the office a basis for study that might prove of value to ship builders, masters, stevedores and the traveling public. The blanks will be sent to any navigator upon request.

In response to numerous requests received from mariners regarding the best methods of observing the heights, lengths, and periods of sea-waves, the angle and period of rolling, and the information desirable to be recorded concerning seismic waves, the Hydrographic Office recommends the following:

Wave Heights.

These should always be taken from trough to crest. The best method that is available to the mariner who is without special instrumental equipment is to climb the rigging or otherwise place himself at a height above the deck sufficient for him to just see the horizon over the top of the wave-crest when the ship is in the trough. In some cases it may be necessary for the observer to lower himself below the level of the upper deck and make his observations from some position on the side of the vessel, as for example through a port. Thus, if the deck is 15 ft. above the water line and the observer must mount 10 ft. above the deck in order that he may just see a wave-crest level with the horizon, the height of the wave is 25 ft. above the water line. If, at the time of observation the vessel rides upright in the trough of the wave, the observed height will be the required height of the wave from trough to crest without any correction or allowance whatever. Three or four sets of ten observations each, taken in this way, will give an excellent determination of the average height of the waves running during the period of the observations.

Wave Lengths.

These should always be taken from crest to crest. With the exercise of care, good determinations may be obtained by direct comparison of the known length of the observing vessel with the length from crest to crest of the waves over which she is riding. Of course it is necessary to note the angle which the keel of the vessel used as a measure of length makes with the line of advance of the waves, in order to reduce the apparent length to the true length.

Another easy method of measuring wave lengths consists in towing a log line astern of a vessel and noting the length of line when a buoy attached to the after end floats on the next wave crest abaft that on which the stern of the vessel momentarily floats. For its successful application the observing vessel should be placed end-on to the waves, or else allowance made for the angle the log line makes with the direction of the ship's course.

Wave Periods and Wave Lengths.

Both may be determined by one process as follows: Two observers are placed as far apart as consistent and at a known distance from each other on the deck of the observing vessel. At each station a pair of battens is erected so as to define, when used as sights, a pair of parallel lines at right angles to the ship's keel. The observers at both stations note, by watches that have been previously compared, the instant when a wave crest crosses the line of sight; they also note how long an interval elapses before the next wave crest crosses their lines. Comparing their records they determine (1) the time (say t seconds) occupied by the wave crest in passing over the length (l ft.) between their stations; (2) the time (say t_1 seconds) elapsing between the passage of the first and the second crest across either line of sight. The latter is the "apparent period" of the waves.

Suppose the ship to be advancing at a speed of V ft. per second *toward* the waves, her course making an angle of *a* degrees with that course which would place her exactly end-on to the waves; then expressing these conditions algebraically:

Apparent speed of wave (ft. per sec.) $= \frac{l}{t}$

Real speed of wave (ft. per sec.) $= V_1 = \left(\frac{l}{t} - V \right) \cos a$

Real length of wave (ft.) $= (V_1 + V \cos a)\ t_1 = l \cos a \cdot \frac{t_1}{t}$

Period of wave $\frac{l \cos a}{V_1} \cdot \frac{t_1}{t} = \frac{l\, t_1}{l - Vt}$

In a ship steaming *away* from the waves it is necessary to change the sign V in the foregoing equations.

It is evident that the simplest conditions for observing the lengths and periods of waves obtain when the observing vessel is placed end-on to the waves and is stationary. The true period and true speed of the waves can then be obtained by direct observation, and the lengths calculated.

Very useful observations can be readily made by two observers with an ordinary watch. One observer can keep his eye on the particular chosen point where the crests of successive waves reach the vessel, while the second observer keeps his eye on the watch, as the time draws near for the crest of the wave to reach the vessel, notes and writes down the time when the first observer sings out "Mark!" With practice one observer can make this kind of observation. Whenever possible the method with battens should be given the preference. The times of several sets should always be reported, though three or even two sets would give a good result.

Caution.

Waves usually come in sets, followed by a comparative lull, during which observations may be uncertain, and great care should be taken not to observe any of the uncertain waves. Confused conditions of the sea should always be avoided for observing, and the observations should be reserved for waves that appear in somewhat regular series. Be careful to note the direction toward which the wave is moving and the course and speed of the vessel. With these data the observed periodic times can be corrected for the vessel's motion when the observations are received in the Hydrographic Office. Observers may reduce their own observations if they prefer.

Rolling Observations.

Battens afford the simplest correct means for observing the rolling, and for several reasons are to be preferred to the indications of pendulums or clinometers.

Battens can be employed whenever

the horizon can be sighted. The line of sight from the eye of an observer standing on the deck of a ship to the distant horizon remains practically horizontal during the motion of the ship. Say a position is chosen on the starboard end of the bridge at which the eye of the observer will be placed; then mark on a vertical batten at the port end of the bridge the height of the eye above the bridge deck as a point of reference. If the distance between the observer and the batten is d feet, the batten can be graduated for an angle of roll θ by the formula—

Vertical set-off on batten in feet $= d \cdot \tan \theta$.

In rolling, as in all other observations, accuracy depends upon the care exercised by the observers.

The *period of roll at sea* can be determined by watch quite accurately while observing the angle of roll, taking the mean of the times of a number of distinct rolls.

Special Information Desired With Regard to Waves of Inundation Following Earthquakes.

Much valuable information is lost because observers are not generally prepared to make observations on the occurrence of an earthquake, or are not aware of the points on which information is specially desired. The value of experiences is considerably lessened when recorded after a lapse of time from memory, as compared with those recorded at the time of the occurrence. For these reasons the Hydrographic Office would emphasize for the consideration of all seafaring men the following questions as indicating the particular observations desired to be made of the waves of inundation.

1. What interval of time elapsed between the earthquake and the arrival of the wave of inundation?

2. What interval of time elapsed between the earthquake and the commencement of the draining away of the water of the harbor?

3. By what amount was the depth of the harbor diminished by the recession of the waters after the earthquake?

4. To what distance from the shore did the wave of inundation enter the city or the land bordering the sea?

5. What was the height of the wave of inundation?

6. How many and of what maximum size were the vessels that were stranded by the wave of inundation, and to what distance were they borne inland?

7. Were there any succeeding waves of inundation, and, if so, what period of time elapsed between the successive waves and what were their height?

8. What was the total time of oscillation of the sea until it quieted down?

A New Alloy

A new alloy, called "Duralumin," has been discovered by Messrs. Vickers, Sons & Maxim, shipbuilders, of Barrow-in-Furness. It will be made at Birmingham, England, and will be on the market in October. H. B. Weeks, the chief chemist of Messrs. Vickers' works, has stated that in the course of investigations they had found an alloy which they believed to be superior to anything of its kind hitherto manufactured. The company had decided to manufacture it on a large scale. The alloy, whilst slightly heavier than pure aluminum, is said to be as strong as steel. It can be rolled, drawn, stamped, extended or forged at suitable temperatures. It is less corrodible than other high aluminum alloys under all the usual tests, and possessed altogether many valuable properties. Messrs. Vickers, Sons & Maxim believe there is bound to be a large demand for it, as it is only one-third the weight of brass. The firm have protected this alloy by patents throughout the world. The belief is further expressed that the new metal will revolutionize many trades which manufacture machinery, etc., where weight of metal is often a great drawback, in order to obtain the necessary strength. Mention is made of the bicycle and motor car trade, and even ship construction in this connection.

Ayudante

To remedy the inconvenience and delay which have existed at Callao, owing, among other causes, to the frequent inability to secure lighterage for their vessels calling with cargo at that port, the Pacific Steam Navigation Co. has provided its agents there with a very neat looking and seaworthy little Thornycroft motor launch, the Ayudante, by means of which they will be in a position to ascertain more promptly than has hitherto been possible, the requirements of the vessels, the lighters that will be necessary for discharging cargo and to make any arrangements that may be required. The launch will also be used for the numerous other duties of the agents which are usually carried out by oar-propelled boats.

Its dimensions are 25 ft. by 5 ft. 6 in. with only 18 in. draught. The hull is carvel built of mahogany, and copper sheathed to water line, to obviate the destructive effects on timber of sea water in that part of the world. The motor is one of the new Thornycroft paraffine type, of moderate revolutions, with two cylinders 4½ in. diameter by 6-in. stroke, developing 15 B. H. P.

With this a speed of over 9¾ miles was attained on trial, as a mean of several runs with and against tide. The power is transmitted through a reversing gear to a Thornycroft solid bronze three-bladed propeller.

The fittings of the boat are complete as for a ship's launch, including slings for hanging in davits, brass stanchions and canvas awning, arranged to tilt to either side to allow head room when embarking, oars, rowlocks, motor horn, lamps, fenders, anchor cable, bilge pumps, etc.

In addition to the tiller a steering wheel is fitted handy to the controlling levers, thereby enabling the boat to be managed by one man.

The launch was surveyed during construction by the board of trade and was finally registered at Liverpool under the Merchants' Shipping Act before being dispatched to Peru.

Steamer with Combination Engines

The launch of the passenger and cargo steamer Rotorua, which took place at the ship yard of Messrs. W. Denny Bros., Dumbarton, recently represents another addition to the number of vessels afloat which are propelled by a combination of reciprocating and turbine engines. The vessel, which has been built to the order of the New Zealand Shipping Co., is 484 ft. by 62 ft. by 35 ft. In the Rotorua steam is first admitted to each of two sets of triple expansion engines driving twin-screws, and then passes to a low-pressure center turbine driving the center shaft before reaching the condenser. The contract for this vessel may be taken as a practical proof of the satisfaction with which the New Zealand Company regard the performance in service of the Otaki, the vessel built some two years ago by Messrs. Denny, and fitted with the combination system of machinery.

The Suez canal shares held by the British government, it is stated by John L. Griffiths, United States consul general, London, yielded $66,661,718 in interest and dividends from 1895 to 1909, inclusive.

A Shameful Exhibit

THE three photographs on the opposite page were taken on Sept. 10, at Winslow, Wash., and show more clearly than any description the effect of shipping eastern coal to the Pacific coast in foreign bottoms and then turning these vessels loose to prey on American shipping. On Sept. 10, there were 17 American vessels of the type shown lying at anchor in Eagle Harbor, Winslow, Wash., idly rotting away. They represent an investment of over $1,000,000, and have a carrying capacity of at least 17,000 tons.

That these idle vessels are not due to a falling off in the total freight tonnage moving to the Pacific coast is shown by the figures on total tonnage on the way, Sept. 10, 1910, as taken from the *Weekly Commercial News*, of Sept. 10, 1910.

Total tonnage on way.	Sept. 10, 1910.	Sept. 10, 1909.
For San Francisco	221,747	179,817
For Portland	57,183	70,485
For Puget Sound	60,893	59,377
For British Columbia	26,063	33,894
For Hawaiian Islands.....	39,816	26,873
	405,702	370,446

This is a balance of 35,256 tons for 1910 over 1909, on the way to the Pacific coast. For the fiscal year ending June 30, 1910, the coal shipped by the United States to the Pacific coast for naval use aggregated 256,947 tons, costing over $1,852,000. This coal was shipped as follows:

To Honolulu:	Tons.	Tons.
In foreign bottoms.....	91,962	
In American bottoms.....	9,637	—101,599
To Mare Island:		
In foreign bottoms.....	11,000	
In American bottoms.....	20,600	— 31,600
To California City points:		
In foreign bottoms.....	44,971	
In American bottoms.....	10,045	— 55,016
To Puget Sound:		
In foreign bottoms.....	68,732	— 68,732
		256,947

Of the total of 256,947 tons, 215,663, or 84 per cent, were shipped in foreign bottoms, and 40,282 tons, or 16 per cent, in American bottoms.

Testing Pacific Coast Coal

IT IS generally known that merchant vessels use Pacific coast coals economically and continuously and get good results from them at a comparatively small cost. There is no good reason why the navy cannot use Pacific coast coal instead of continuing the senseless practice of bringing all its coal from the eastern coast. The navy department has finally decided to make a test of three or more Washington coals for comparison with eastern coal. These tests will be made on the cruiser Maryland on the Pacific and the cruiser West Virginia on the Atlantic, under as nearly identical conditions as possible. Just why the Maryland and the West Virginia should be selected is not clear in view of the facts so clearly stated in THE MARINE REVIEW of June, 1910, under the heading, "A Straw Navy." Be that as it may, the people of the Pacific northwest are awaiting the results of the trials and expecting that fair use will be made of the results obtained. It is admitted that Pacific coal is not the equal of Pocahontas coal for steaming purposes, but an unbiased comparison of the relative costs of the coals used will show an enormous saving over the cost of Pocahontas coal by using Pacific coal.

But there is no hope that the policy of the navy department will be changed in the slightest degree by the proposed coal tests. The department knows now all it wants or needs to know and THE MARINE REVIEW has heretofore published facts and figures regarding the heat values of Pacific coast coals derived from the government's own published reports, made by its own experts, showing that the indispensable eastern coals are only 6 to 9 per cent better than some of the Washington coals. The navy can make as much steam for $1 with Washington coals as for $3 to $4 with eastern coal, and this is true without qualification or modification.

The reasons for using eastern coal are not of an engineering nature nor yet military, as is perfectly understood by all familiar with the subject; they are not even geographical, and statements to the contrary are merely issued for general consumption.

The selection of the Maryland and West Virginia was the master stroke. Two ships of the highest and finest type, yet which limped into San Francisco on their return from an eastern cruise almost complete wrecks in their machinery department, as was fully set forth in THE MARINE REVIEW for June, 1910, because of the inexperience and incompetency of their officers, the chief engineer of one of them, for instance, never having had any engine room experience whatever previous to joining her, and the chief engineer of the other had 15 months. The fleet engineer of the Pacific fleet, under whom these trials will presumably be carried out, has had but a few months' experience as chief engineer and but little more in all his engine room life.

The Pacific northwest owes much to Congressman W. E. Humphrey, of Washington, and G. F. Thorndyke, of Seattle, in securing a test of Pacific coals by the navy department. Almost single handed, they have carried forward the demands of the northwest in the matter of using Pacific coast coal in the navy.

It is greatly to be feared that those who think that the proposed trials, which after all are merely a cheap attempt at shutting off proper criticism, will develop anything worth knowing, are doomed to nothing but disappointment.

In connection with the proposed tests of Pacific coast coal by the United States navy, the following certificate of the chief engine r of the French Pacific squadron relative to western coal taken aboard the cruiser Montcalm at Seattle, may be of interest:

By your letter of Aug. 26, you have asked me for information concerning the coal furnished us at Seattle.

The results obtained have been quite satisfactory. Our observations of the coal while it was used on board were as follows:

The coal taken on at Seattle contained a considerable proportion of fine coal, in the neighborhood of 40 per cent. It is a bituminous coal, does not coke on the grate, and would be improved by being mixed with coking coal like the coals of the east—Pocahontas, Cumberland, New River, etc. At first it gives off an abundance of smoke, with a long, yellowish flame. It should be burned in a thin fire (4 to 5 in.) with a slightly active draft. It should be fed forward in the furnace a little at a time and the incandescent coal pushed back each time before feeding. The grates should be spread 2/5 in. as a maximum.

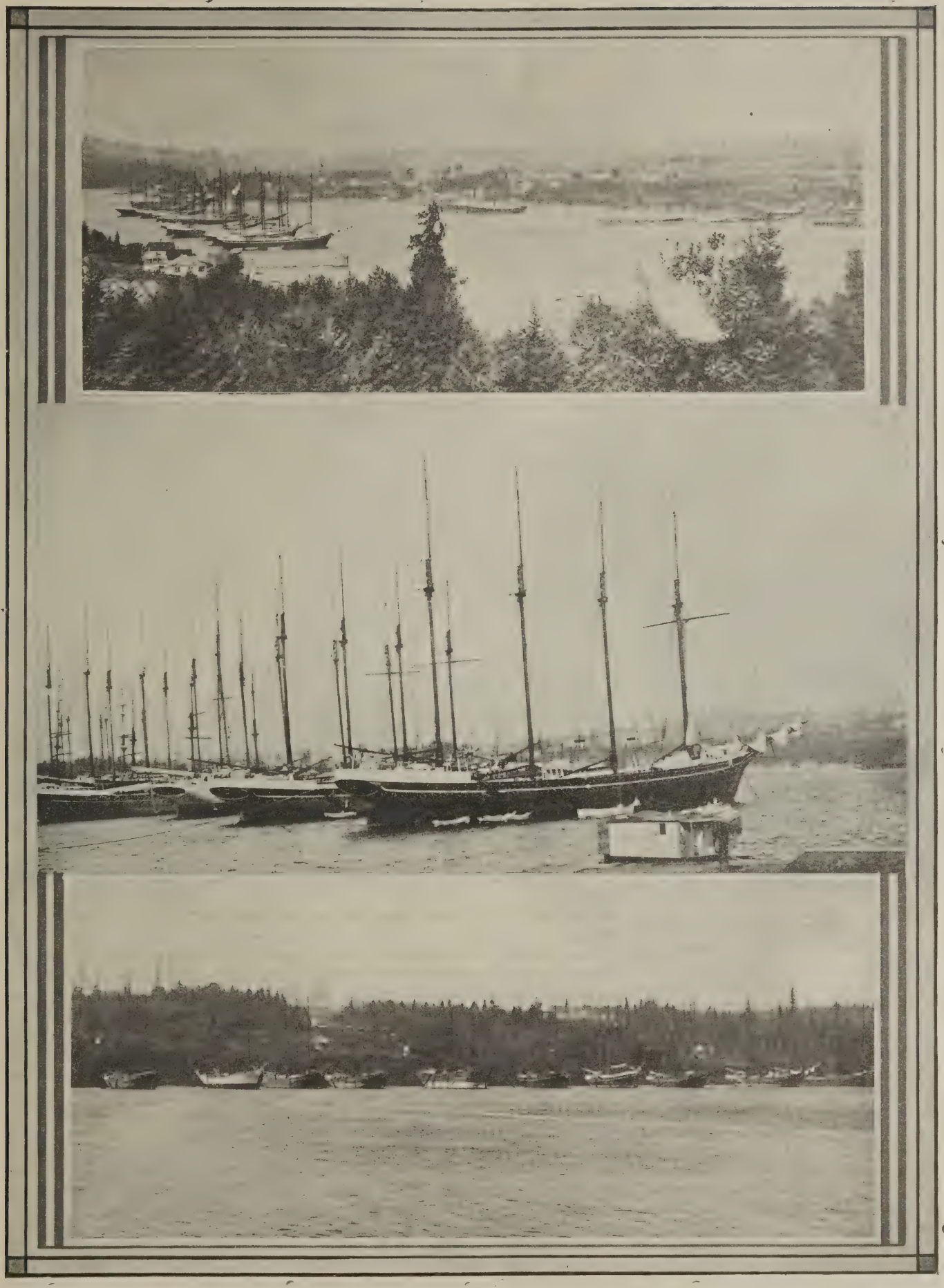
The coke is friable and falls easily into the ash pan. If too much of it should work through, the coal cinders ought to be sifted. There is very little scoria which sticks to the grate and there is very little soot.

Taking Pocahontas for purposes of comparison, this coal can be given a value of 0.9 under conditions where the rate of consumption does not exceed 20 lb. per sq. ft. per hour. Yours, etc.,

A. LE LAN.

Manzanillo, Sept. 3, 1910.

Assistant Secretary Winthrop, when confronted with the experience of Pacific mail liners and other commercial ships, said that the satisfactory service obtained with western coal in the merchant marine was no evidence that it was suitable in ships of war. It was pointed out that the British Pacific fleet used western coal for cruising purposes, just as suggested for our own, and now comes the evidence of still another navy. We stated then



THESE PICTURES SHOW WHAT HAPPENS TO AMERICAN SHIPS WHEN THE GOVERNMENT OF THE UNITED STATES VIOLATES ITS OWN COASTWISE LAWS.

that the tests conducted by the Geological Survey showed that Pocahontas was only 6 per cent higher in efficiency, and the service tests in the French cruiser reported above agree with the Survey reports very closely.

Obituary

Frederick Meriam Wheeler died at his summer home, Westhampton, Long Island, of heart disease, on Sept. 15. Mr. Wheeler was born in Brooklyn, N. Y. His father, John Wheeler, a native of England, married Jane Meriam, of Brooklyn, a direct descendant of Joseph Meriam, who came to America on the ship Castle in 1638 and settled in Concord, Mass. Mr. Wheeler was graduated at Summit Academy, N. J., and subsequently attended the Polytechnic Institute at Brooklyn. He studied mechanical engineering for four years under Henry J. Davison, of New York. He afterwards took up hydraulic and marine engineering as a specialty and for over 34 years was associated with the George F. Blake Mfg. Co. He was a director and secretary of the company and later a director of the International Steam Pump Works, which absorbed the Blake company.

Mr. Wheeler was the inventor of the Wheeler patent surface condenser. He organized the Wheeler Condenser & Engineering Works, whose plant is located at Carteret, N. J. He was also connected with the Ludlow Valve Mfg. Co. He was one of the charter members of the American Society of Mechanical Engineers and the Society of Naval Architects and Marine Engineers. He was also a member of the American Society of Naval Engineers and the Engineers' Club. He served as a member of the advisory council of the Engineering Congress at the Columbian Exposition.

In 1876 he married Florence Wilmer, of Montclair, N. J. Mr. Wheeler was prominent in social circles in Montclair for many years. He is survived by a widow, two daughters and two sons.

Trial of Torpedo Destroyer Sergipe

The official speed trial of the torpedo boat destroyer Sergipe, built for the Brazilian government by Messrs. Yarrow & Co., Ltd., of Glasgow, took place last month on the Skelmorlie deep water measured mile at the mouth of the Clyde, and the contract speed of 27 knots carrying a load of 100 tons was easily exceeded. The actual speed obtained was 27.676 knots on the mile, and 27.605 knots during a continuous run of three hours' duration.

The trial was under the supervision of Capt. Amynthas Jose Jorgo, Capt. Ribeiro da Costa, Capt. Alvaro Rosauro de Almoida, Lieut. A. Marques and Lieut. A. F. da Rocha, representing the Brazilian naval commission.

The Sergipe is the last of the ten destroyers ordered by the Brazilian government from Messrs. Yarrow. The first seven vessels are now in commission in Brazil, the eighth has just left the Clyde, and the ninth has been handed over to the Brazilian authorities and will shortly leave for Rio.

The dimensions of the Brazilian destroyers are: Length, 240 ft.; beam, 23 ft. 6 in. They are propelled by two sets of four-cylinder reciprocating engines 8,000 H. P. collectively, balanced on the Yarrow, Schlick and Tweedy system. Steam is supplied by two double-ended Yarrow boilers of the latest type.

SUMMARY OF NAVAL CONSTRUCTION.

Name of Vessel.	Building at.	1910: Per cent of Completion. Aug. 1.	Sept. 1.
BATTLESHIPS.			
Florida	Navy Yard, New York	71.0	74.2
Utah	New York S. B. Co.	83.2	85.5
Wyoming	Wm. Cramp & Sons	32.3	35.5
Arkansas	New York S. B. Co.	39.5	43.9
TORPEDO BOAT DESTROYERS.			
Paulding	Bath Iron Works	93.4	98.9
Drayton	Bath Iron Works	88.1	91.7
Roe	Newport News S. B. Co.	97.1	99.3
Terry	Newport News S. B. Co.	91.5	93.5
Perkins	Fore River S. B. Co.	92.3	93.8
Sterett	Fore River S. B. Co.	88.4	89.8
McCall	New York S. B. Co.	89.6	95.5
Burrows	New York S. B. Co.	87.5	92.7
Warrington	Wm. Cramp & Sons	79.5	81.4
Mayrant	Wm. Cramp & Sons	80.8	82.0
Monaghan	Newport News S. B. Co.	28.4	31.3
Trippe	Bath Iron Works	56.7	62.6
Walke	Fore River S. B. Co.	47.6	52.8
Ammen	New York S. B. Co.	56.3	65.4
Patterson	Wm. Cramp & Sons	40.7	44.6
SUBMARINE TORPEDO BOATS.			
Salmon	Fore River S. B. Co.	97.8	98.4
Carp	Union Iron Works	60.0	62.0
Barracuda	Union Iron Works	60.0	62.7
Pickerel	The Moran Co.	56.8	58.1
Skate	The Moran Co.	56.8	58.1
Skipjack	Fore River S. B. Co.	48.6	54.0
Sturgeon	Fore River S. B. Co.	46.2	52.5
Thrasher	Wm. Cramp & Sons	7.9	10.8
Tuna	Newport News S. B. Co.	29.9	31.8
Seal	Newport News S. B. Co.	52.2	54.4
COLLIERS.			
Cyclops	Wm. Cramp & Sons	84.3	89.9
Neptune	Maryland Steel Co.	37.9	43.2

Ask for Bonus

The Canadian government has been asked to give an annual bonus of $250,000 for fifty years for the construction of a dry dock and ship repair plant at St. John, N. B., and a dry dock and ship building plant at Levis, Que. The companies making the application are Harland & Wolff, Belfast, Ireland, McArthur & Perks, who built the Manchester ship canal, the Canadian-Pacific, Allan, Dominion, Manchester and White Star lines. So many of the big liners are now conducting a regular service to Canada that the question of adequate dry dock facilities has become an urgent one. The sum mentioned for the construction of the Levis yard is $3,750,000.

The oil-burning, turbine-driven torpedo boat destroyer Terry, built by the Newport News Ship Building & Dry Dock Co., Newport News, Va., developed 32.188 knots an hour on her standardization trials over the measured mile off Lewis, Del.

The new steamer Verona, built by Martinolict Bros., Dockton, Wash., to run between Tacoma and Quartermaster harbor, is equipped with Seabury engines furnished by the Gas Engine & Power Co., and Charles L. Seabury & Co., Consolidated, Morris Heights, New York. Her water-tube boilers are supplied by the Taylor Water Tube Boiler Co., of Detroit. The steamer is 124 ft. long, 22 ft. beam, and 7.7 ft. deep.

Under an agreement participated in by owners of vessels in France, Germany, Norway and England, all craft not having their loading marks plainly on the side midway between bow and stern by Nov. 1 will be subject to fine. Circulars to that effect have been received by consuls of the countries concerned to whom complaints of non-compliance are to be made. The rule does not apply to American vessels.

A ONE HUNDRED-TON FLOATING CRANE

By Walter G. Stephan.[1]

THE operation of a crane, whether it be an ordinary hand crane, an electric overhead traveling crane or a locomotive crane, is always interesting. Possibly it is the great utility of this class of machines which makes them so fascinating to us, or perhaps it is the perfection and simplicity of their mechanism which gives them their charm. Certainly, cranes now perform much of the work formerly done by the main strength of many hands. One of the most interesting recent developments in crane construction is the 100-ton floating crane just completed for the Bremerton navy yard at Puget sound, Wash. It is the most interesting because it is believed to be the largest crane of its kind in the world, the next in size being the crane "Hercules," which was built to lift 100 short tons, while the crane which is the subject of this article is designed for 100 gross tons.

The designer of a machine to be used on land can usually depend upon a solid foundation for support, but the designer and builder of this monster marine crane, the Wellman-Seaver-Morgan Co., Cleveland, was confronted with a very complex problem, which involved questions of stability, with its related problems of center of gravity, metacenter, draught and maximum allowable inclination. The recent elaborate tests made by the government engineers have proven conclusively that the crane is exceptionally stable and capable of handling more than the specified loads. The loads accompanying photograph gives a good idea of the construction of the main framework and will illustrate the uses to which the crane is to be put. It is shown in position ready to unload part of the machinery of the cruiser Washington.

The government specifications called for a structure to be mounted upon a floating pontoon, and intended for lifting and moving guns, turrets, armor plates, boilers and other materials to and from cars, wharves and ships at the Puget sound navy yard at Bremerton. It must possess in a high degree safety, stability and ease of manipulation.

The Pontoon.

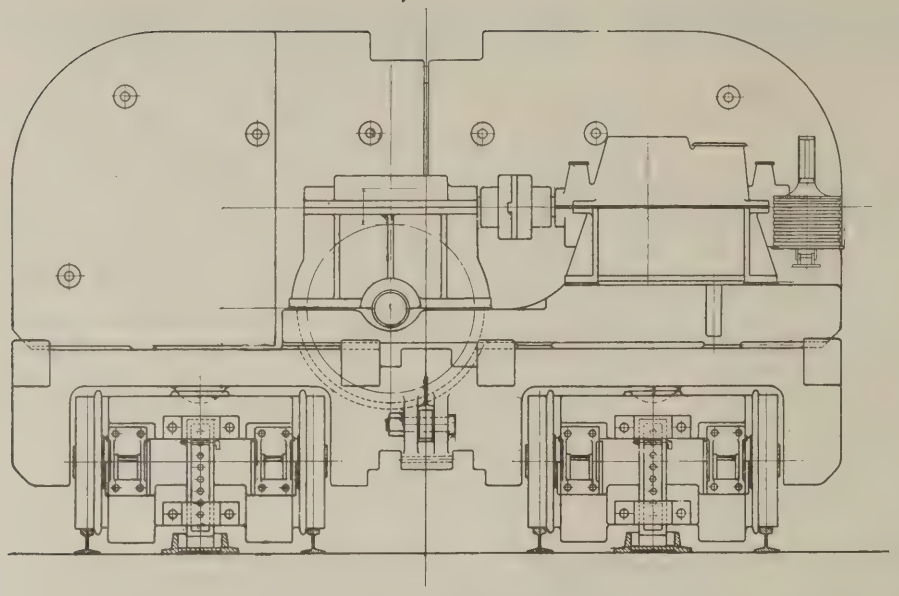
The pontoon which supports the main frame is built entirely of open-hearth steel, and it is provided with fenders, guards, mooring bitts, cleats and all other attachments necessary for convenient and successful operation. It is approximately 100 feet long and 60 feet wide, and is divided into six water-tight compartments by bulkheads extending full length and width. Four single barrel reversible steam capstans made by the American Ship Windlass Co. are provided for maneuvering.

It was specified that the crane must have a freeboard of not less than 3½ feet when lifting the maximum load, and in addition must have a capacity in excess of these loads of 300 gross tons deck load, with a freeboard for the combined loads of not less than 2 feet, conditions which of course called for the most careful calculations on the part of the engineers.

The main frame is of structural steel and consists of two A frames, with bracing, supporting three independent trolley tracks each about 220 feet long, carried at a height of about 80 feet above the deck. Each canti-

Floating Crane in Working Position Alongside Cruiser Washington.

[1]Cleveland.

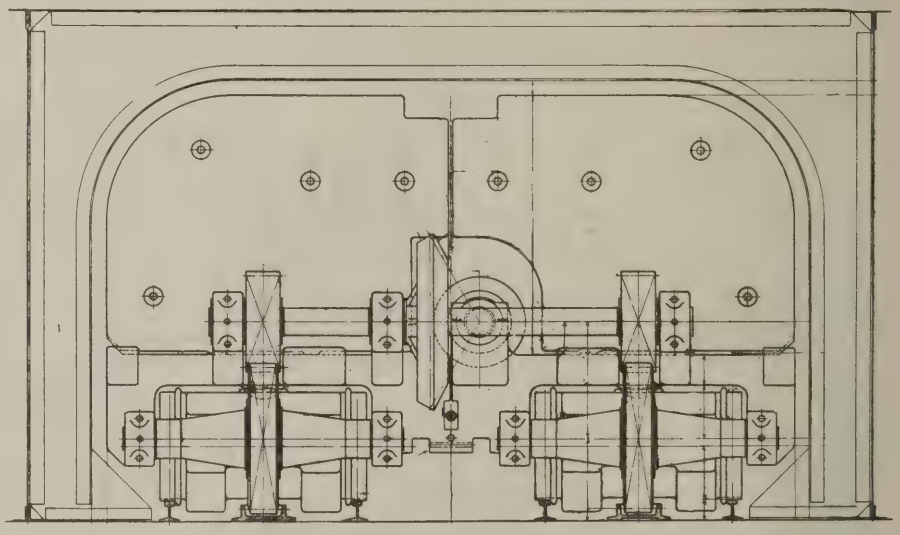


END ELEVATION.

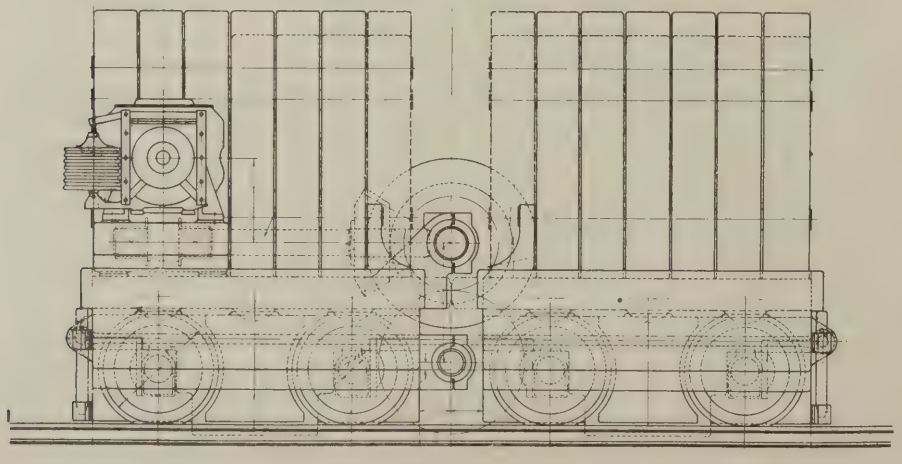
lever is about 65 feet long and permits the trolleys to reach beyond the center line of any warship now built or building. The center track is for the auxiliary trolley and the outer tracks for the two main trolleys.

The Main Hoist.

The main hoist has a lifting and traveling capacity of 100 gross tons (224,000 pounds) and the mechanism is so arranged that both operations can take place at the same time. The two main trolleys are each mounted on eight spring-equalized wheels, and each is capable of handling 50 gross tons. The trolleys can be handled separately or together as desired. The hoist cables are of 1⅜-inch plow steel and lead over a series of sheaves to the two main hoisting drums in the machinery house on deck. These drums are gear-driven by a pair of 12 x 15-inch hoisting engines through two separate sets of gearing, giving a low speed for lifting the maximum load, and a higher speed for the empty hook. The main trolleys are traversed by a pair of 10 x 12-inch reversing engines, geared to a 60-inch drum, so that this operation is independent of the hoisting motion. The specified hoisting speed of the main hoist with a full load was a minimum of 7 feet per minute with a trolley travel speed of not less than 100 feet per minute. Without load the speed of the hook was to be not less than 100 feet per minute.



CROSS SECTION AT CENTER.



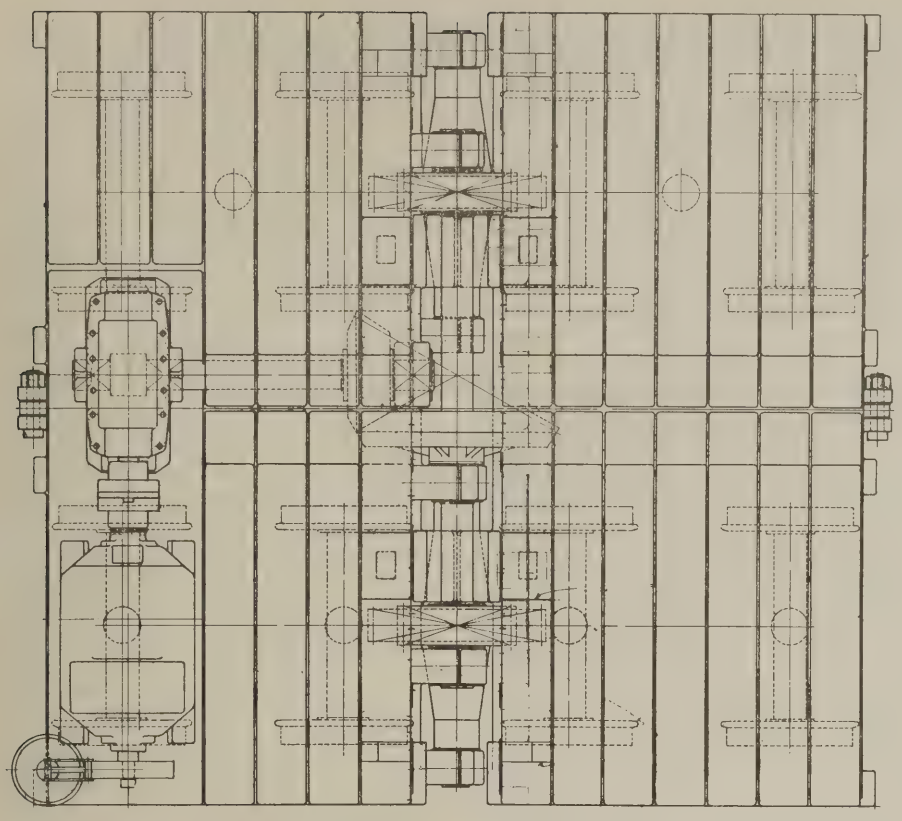
SIDE ELEVATION.

The Auxiliary Hoist.

The auxiliary hoist has a capacity of 15 gross tons (33,600 pounds) and is operated from a single four-wheel trolley traveling on the center track. Its cables lead to separate hoisting and traveling drums similar to those of the main hoist. The operations of hoisting and traversing can be carried on simultaneously. The auxiliary trolley machinery is located in a separate steel frame house on one side of the deck, and the operating levers are all carried to a separate operator's house above it. With full load the specifications called for a hoist speed of not less than 50 feet per minute and a trolley travel speed of not less than 200 feet per minute. The hoist speed with empty hook was to be not less than 100 feet per minute.

The Power Plant.

Steam at 150 pounds is supplied to the hoisting and trolleying engines, the pumps, generator set and the steam windlasses by two 60-horsepower marine type boilers. For supplying current for the electric motor on the counterweight and also for the electric lights, a Shepherd vertical high-speed engine is provided, direct connected to an 87-kilowatt Westinghouse 250-volt generator. This equipment makes night operation practica-



PLAN OF COUNTERWEIGHT CAR.

ble, as the machine is liberally provided with electric lights.

An electrically-driven centrifugal pump is located in the machinery house, for pumping out the water-tight compartments, and stairways, with water-tight hatches, are fitted for convenient access to the hold. At one end of the machinery house is a neatly appointed office for the use of the officer in charge.

The Automatic Counterweight.

By far the most interesting and unique feature of this machine, however, is the automatic counterweight, which consists of a series of heavy castings bolted together, two of which are so formed as to make truck castings to support the axle bearings. This counterweight car (weighing about 600,000 pounds) travels on double tracks laid lengthwise through the center line of the floor of the hull. The line engravings show end and side elevations and plan of this device. This counterweight is necessary in order to prevent the machine from listing more than the specified limit of 3 per cent in either direction. On top of the car is mounted a 100-horsepower Westinghouse mill-type series wound motor which drives, through a worm and worm wheel, a pinion which meshes with a rack lying between the rails on which the counterweight runs. In order to stop the weight immediately when desired a solenoid post brake is provided, which releases the brake when current is applied and sets it when the current is interrupted.

The current for the motor is regulated by a controller mounted right on the counterweight. This consists of a number of magnetically operated switches and an automatic device for limiting the starting current of the motor. To start the motor in a given direction it is only necessary to supply a small magnetizing current to the solenoids which operate a group of magnetic switches which then close in proper rotation until full voltage is applied to the motor. Current is collected from two contact bars, by means of sliding shoes mounted upon the counterweight.

The current for operating the controller switches is applied by a pendulum-operated switch which swings in a plane parallel to the bridge and counterweight track. This is the ingenious feature of the counterweighting apparatus. When the load has given the bridge a predetermined list, the pendulum closes a contact on that side which supplies current to the proper group of controller switches, which, in turn, set the motor armature in motion in the proper direction to counterbalance the load. When the position of the load is altered so that the machine is listed in the opposite direction, the pendulum swings in the opposite direction, closing another contact which supplies current to the other group of switches and brings the counterweight back until the pendulum again swings free. To provide against overtravel, a limit switch is provided, to stop the motor automatically at each end of its runway. A manually operated controller is also fitted, so that the counterweight can be operated by hand when desired. This electric automatic counterweight system has proven very satisfactory, and has been patented by the Wellman-Seaver-Morgan Co. An interesting feature in connection with its operation is the unusual use which has been made of it. When it is desired to take a lift very slowly, the hitch is made and a strain taken on the cables. Then the counterweight is moved gradually up the incline, increasing the strain on the cable and thus carefully lift the load. The nicety with which this can be done is very interesting to observe.

The crane was recently tested for acceptance by the government engineers and more than fulfilled the specifications. The test load for the main hoist consisted of pieces of armor plate weighing almost 243,000 pounds, which was handled very easily by the hoisting engines, although it is about 8 per cent in excess of the specified load. The test load for the auxiliary hoist was over 39,000 pounds, about 16 per cent in excess of requirements.

A Large Floating Shear Leg

Herewith will be found an interesting example of another type of hoist of equal capacity, which is usually found as an item of shore equipment. This has been installed by the Vulcan Co. in its new shipyard at Hamburg.

The questions of stability involved are considerably greater in the case of the shear leg, because of the great height of the legs, which are 143 feet 7 inches long from center of pivot bearing to the head. The legs have a maximum outfall of 47 feet 5 inches. The arrangement of pontoons is noteworthy. There are two pontoons, that in front upon which the legs are stepped being 92 feet 8 inches long, 36 feet wide and 9 feet deep, and the second, connected to the first by girders, as seen in the illustration, is 74 feet by 29 feet 6 inches by 8 feet 3 inches, the distance between centers being 32 feet 10 inches. The distance between the two pontoons may be varied by means of cable and capstan gear driven by the main engine and

is determined by the overhang of the legs. This has the effect of doing away with shifting ballast. The girders extend across the rear pontoon and the head guys are attached to their extremities. Three sets of falls are provided, of 100-ton, 20-ton and 5-ton capacity, respectively. The Vulcan Co. has already at its yard at Stettin two floating shears of 100-ton and 50-ton capacity, and that they have been satisfactory is evident by the addition of this third unit at the new yard.

In the fitting out of large ships under a stationary leg the ship has to be continually shifted in order to bring the point of deposit fairly under the head of the shears, and with the large ships for which the new yard is specially fitted, this shifting involves much time and labor. In the background will be seen a type of crane which has come into considerable favor in recent years for fitting out docks, namely, the tower crane, which not only has a movement parallel with the face of the wharf but has a range of the entire circle covered by the cantilever arm.

Other examples of large floating cranes of still greater capacity are to be found at Harland & Wolff's shipyard, Belfast, Ireland, and at Krupp's, Kiel, Germany. Both of these are of the same type and capacity, namely, 150 tons. In size, however, these cranes completely dwarf those previously described. The cranes are of the lift jib type, the jib being pivoted at the top of a revolving tower. The peak of the jib in its highest position is 245 feet above the deck of the pontoon. The working radius with full load is 98 feet 6 inches; with 110 tons, 131 feet; and with 35 tons, 148 feet. A test load of 200 tons was applied at the normal full load radius, 98 feet 6 inches. The least radius of the peak of the jib, from which the 150-ton fall is hung, is 32 feet 10 inches. There are, in addition, two auxiliary trolleys of 35 and 10 tons capacity respectively, which travel along the lower flange of the jib. Two motors with a total horsepower of 135 are provided for the 150-ton fall, one 90-horsepower motor for the 35-ton trolley and one of 55 horsepower for the 10-ton trolley. Two 17-horsepower motors operate the turning gear, effecting a complete turn in 6½ minutes. The pontoon, which is self-propelling, has a length of 131 feet, a width of 85 feet 4 inches and a depth of 14 feet 9 inches. The crane tower is located on the center line of the pontoon. The greatest angle of heel of the pontoon with maximum load at maximum radius is stated to be between 5 and 6 degrees.

ONE HUNDRED-TON FLOATING SHEAR LEG AT VULCAN CO.'S YARD, HAMBURG.

New Steamer for Merchants' Transportation Co.

Manager F. H. Marvin, of the Merchants' Transportation Co., Tacoma, has placed a contract for the construction of a single screw, passenger boat for the Tacoma-Olympia run with Martinolich Bros., Dockton, Wash. The new boat will be named Nisqually, and will be 135 ft. long, 22 ft. beam and 8 ft. draught. She will be fitted for oil fuel, and powered with an 850-H. P., triple-expansion engine. She will have accommodations for 450 day passengers. Her specifications call for a speed of 17 knots, to enable her to make three round trips daily between Olympia and Tacoma. The main cabin will be 85 ft. long by 16 ft. wide, with an observatory plate glass front and wide promenade on either side and an open deck aft. The Nisqually will be ready for operation next spring. The contract for her machinery has been awarded to the Great Lakes Engineering Works, Detroit.

Martinolich Bros. have also recently completed for C. E. Wiman, Dockton, a single screw, day passenger vessel for service between Tacoma and Quartermaster Harbor. The new boat, Verona, is 124 ft. long, 22 ft. beam, and has accommodations for 300 day passengers, and is said to have a speed of 17 knots.

ATLANTIC DEEPER WATERWAYS ASSOCIATION

THE convention of the Atlantic Deeper Waterways Association held at Providence, R. I., in September, was very widely attended and it was estimated that altogether in the harbor there were a thousand craft of various kinds. Briefly, the purpose of the convention was to promote the building of an inland waterway from New England to Florida. Gov. Aram J. Pothier, of Rhode Island, welcomed the delegates on behalf of the state. The response on behalf of the north was delivered by Congressman W. S. Greene, of Massachusetts, who declared that the construction of a waterway inside the dangerous shoals and currents of the Atlantic coast was far more valuable to the business interests of the United States than the construction of the Panama canal.

Congressman John H. Small, of North Carolina, responded on behalf of the south. He said that the coast line of the South Atlantic and Gulf states extends a distance of 3,007 miles, while the coast line of the North Atlantic states is 888, and that of the Pacific States 1,557 miles. He pointed out that the commerce of the southern ports is growing very fast, and that Galveston today holds the position of second in value of exports. He declared the wealth of the south to be six billion more than the total wealth of the whole country in 1860. There is only one obstacle, he declared, in the way of mutual progress, and that is the lack of an intra-coastal waterway. A protected water route from Boston to Florida would forever emancipate commerce from the terrors of Cape Cod and Hatteras.

President Moore's Address.

President J. Hampton Moore, in his annual address to the association, said: "The formation of the Atlantic Association was notice not only to the west, but to the east and to the government as well, that we too, upon the Atlantic seaboard, had goods to ship and contracts to keep; that we, too, had swamp lands to drain and farms to irrigate, and timber lands to protect; that more than this, we had crops to be carried to the consumer, crops from Florida, for instance, that were as distant from the market and as worthy of sale and transportation as those of the great northwest; that we, too, had great transportation problems and fewer railroads than our competitors; that we, too, desired an outlet by water for our farmers and merchants and manufacturers if we could not get it by rail. In short, it was a notice that we had something along the Atlantic seaboard to fight for."

Rear Admiral C. S. Sperry also made a brief address, saying among other things:

"The great systems of canal and river transport which center in New York demand a secure outlet to the eastward by way of Long Island sound for their heavily-laden barges, and, although the Cape Cod canal is of great value, it is still very desirable to provide such a canal as has already been advocated before the Association in order that such craft may avoid the stormy seas of Point Judith and proceed in safety to Massachusetts bay, distributing the benefit of their transport to the great industrial towns of the interior as well. The inland waterways of the Atlantic coast not only provide security for our great coasting trade from the perils of the sea and war, but they also afford the highway for the patrol of the coast by torpedo boats and submarines."

Addresses were also made by Commander Alfred Brooks Fry, chief engineer in the United States Treasury Service, who spoke on the subject, "Commercial Canals and Lock to Carry Barges of 600, 1,000 and 2,000 tons Capacity." Herbert Knox Smith, commissioner of corporations, spoke on the subject of "Port Terminals."

Congressman Goulding, of New York, read a paper prepared by Calvin Tompkins, commissioner of the Department of Docks and Ferries, on the subject, "Terminal Facilities Required for the Successful Co-ordination of Rail and Water Traffic." He thought Canadian, European and South American cities were making greater advances in terminal facilities than American cities.

O. P. Austin, chief of the Bureau of Statistics, Department of Commerce and Labor, spoke on the subject, "Atlantic Seaboard Commerce, Inland and Coastwise." Gov. Frank B. Weeks, of Connecticut, spoke upon "Connecticut's Water-borne Commerce."

Resolutions Adopted.

The association adopted resolutions as follows:

"The Atlantic Deep Waterways Association, in convention assembled in Providence, R. I., August, 1910, speaking directly for a constituency of more than 30,000,000 American citizens dwelling and doing business upon the Atlantic seaboard, presents to the American people generally the following statement of its purposes and of the facts upon which its cause and its demands are based.

"First—The aim is to cut deep waterways through about 70 miles of obstructive necks of land, along a line plainly indicated by nature and perfectly practicable, so that, fairly parallel with the coast, an inland channel shall be created approximately 1,500 miles in length, reaching from Boston harbor to and including Florida and ultimately having extension to the Gulf and to New Orleans.

"Second.—This proposed channel will lie along a coast on which are situated the big front doors from the Atlantic to the entire country, and it will be tributary not only to all the many minor but important ports of the nation on that coast, but to the four great cities, Boston, New York, Philadelphia and Baltimore, the customs receipts of which are four-fifths of all the revenue of the government from the tariff.

"Third.—Thus the proposed enterprise cannot be regarded as sectional in its character. It is, indeed, certain to be productive of important and profitable commercial consequences to all the states affected by the influence of transportation rates east of the Rocky mountains. We heartily favor all projects approved by the United States engineers for the improvement of inland waterways in the Mississippi valley and far west, but, lest these should appear to have importance much superior to that of the enterprise to which we are committed, we point to the fact that the entire tonnage of the Mississippi and Missouri rivers in the year 1907 was not much more than that of the single port of Providence, R. I.

"Fourth.—We demand the construction at an early date of the deep waterway along the Atlantic coast as a measure imperatively required to prevent the strangulation of the trans-

portation business of the millions of people affected by the seaboard commerce. Railroad expansion clearly cannot meet, in any length of time, the swift-growing requirements of American business; at the best railroad expansion, no matter what time may be given, is necessarily limited, while the possibilities of expansion upon waterways, properly constructed, are practically without limitation. It is clear to us that it must be greatly to the public advantage that the demands of the prospective certain growth of commerce shall be anticipated rather than that they shall be disregarded until the choking of the channels of trade and the semi-paralysis of business shall make remedial measures compulsory after heavy losses have been inflicted. The time for action is now. Prevention of congestion, not delay until there must be relief from congestion, is what we aim at.

"Fifth.—The American people, producers, business men and the great body of consumers, are entitled to the lower costs and the savings which always ensue upon resort, upon a large scale, to a water transportation. That cost is rarely half, and often very much less than half, of the movement of commodities by rail; and besides, removal to inland and perfectly safe channels of much of the coastwise carrying trade now forced upon the sea will mean large saving of insurance, of time, of loss of property, of money and of human life.

Appeal to New England.

"Sixth.—We appeal strongly to New England to stand by and actively to promote this great enterprise. Surely that important part of our country needs, in a particular degree, emancipation from almost complete dependence upon railroads. Taking in every year 24,000,000 tons of coal and sending out $2,000,000,000 worth of her manufactures, New England has requirements for the economical movement of commodities which should enlist her public sentiment and the efforts of all her public men in the active promotion of the Atlantic deeper waterways.

"Seventh.—This undertaking has the peculiar fortune that no important interest is openly arrayed against it, and no noteworthy argument for its abandonment has ever been presented from any source. The case is and always has been one-sided, and in the continued absence of a negative the affirmative would, in our judgment, have won its case long ago but for the apathy of the people who have not yet learned in what direction their best interests lie.

"Eighth.—Upon the communities verging on the proposed Atlantic coast inland waterways we urge strongly the necessity that there shall be early preparation for enlarged commercial operations by the acquirement by the public authorities of water frontage, by the equipment of each port with modern mechanical appliances for movement of freights and by the creation generally of terminal facilities which will be effective for the loading and unloading and the economical handling of commodities.

"Ninth.—We direct attention, in conclusion, to the following facts:

"The Federal government should construct the waterways, because they will be a part of the coast defense in time of war, because the channels should be as free to all comers as are the river channels now controlled by the general government, and because the enterprise is distinctly national and not local.

"If Americans will look at the canal construction already completed and now in process of large extension in the civilized countries of Europe, and even in Canada, they will find an incentive to action, not only from national pride, but from the conviction that, with all our progressiveness, we are being left behind by other peoples.

"Tenth.—It is the recommendation of this association that Congress shall extend the internal waterways survey to and including the coast of Maine.

Resolved, That this association make grateful acknowledgement and extend most cordial thanks to the State of Rhode Island, through her distinguished governor and legislature to the city of Providence, through his honor the mayor and municipal council, to the Providence Board of Trade, to the several committees and all the citizens of the state and city for the genuine welcome, the complete and systematic arrangements and the lavish hospitality provided for the delegates to the third annual meeting of the association."

Steamer Currier

THE steamer Currier was launched from the yard of the Fore River Ship Building Co., Quincy, Mass., on Sept. 20, being christened by Miss Anne Currier, daughter of Guy Currier, of Boston, for whom the vessel is named. The Currier will be ready for her maiden trip to Havana in November. She is building for the Cuba Distilling Co.

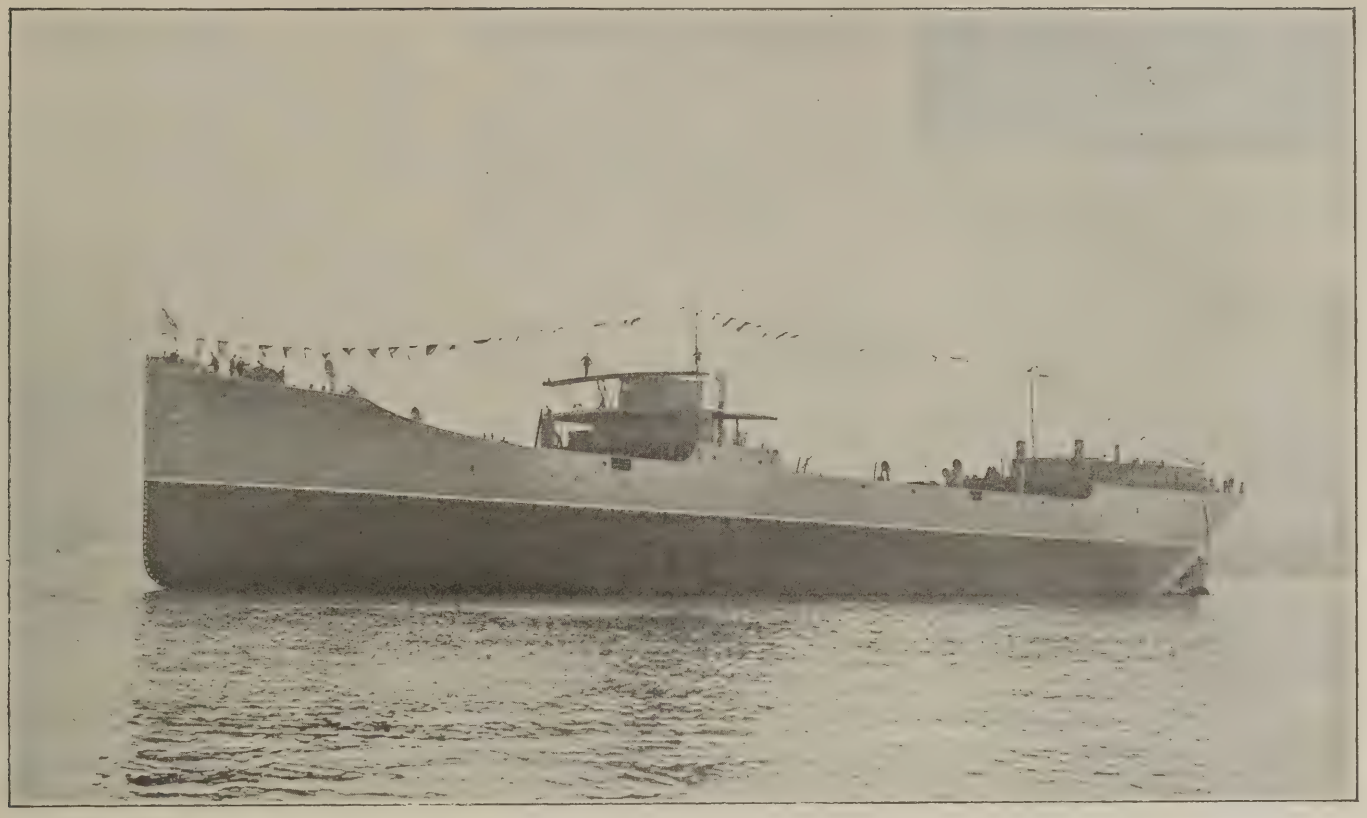
The Currier is a single screw steamer constructed of steel to the highest class in Lloyd's register and specially designed to be operated in either the molasses, bulk petroleum or general freight trades, a combination rarely met with in cargo vessels. The principal dimensions are 370 ft. by 52 ft. beam, and operating on a draught of 22 ft. 6 in., the vessel will carry 6,500 tons deadweight.

The arrangement of the ship consists in placing the machinery right aft and dividing the dead flat body into five double tanks each bounded by transverse and centerline oil-tight bulkheads. A general cargo hold is fitted forward and aft of these tanks, and the steamer has a continuous inner bottom as far forward and aft as practicable. These tanks may be utilized for the transport of either mollases or bulk petroleum, for which purpose they have a special pumping system installed for either loading or discharging the liquid cargo. The wing spaces at each side of expansion trunk, together with the forward and aft cargo holds, can be used for the carriage of general freight cargoes together with the oil tanks when not operating in the petroleum trade. For this reason the ship has been provided with two steel pole masts, each rigged with four 5-ton derricks for the rapid handling of general merchandise.

The Currier has a long poop, short bridge and top-gallant forecastle, the former of which encloses quarters for the firemen and seamen with a poop deck house arranged with commodious quarters for the engineers. The bridge house is fitted up with cabins, saloon, pantry, etc., for the navigating officers, and has a steel deck house on top specially arranged with a suite of rooms for the captain.

All the latest and most approved auxiliary machinery has been installed comprising a Hyde steam windlass, combined steam and hand steering gear, stem capstan, powerful deck winches, electric light throughout, and the usual pumping, drainage, fire main, sanitary and fresh water system.

The propelling machinery consists of a set of triple-expansion engines supplied with steam by three single ended Scotch boilers, the installation developing sufficient power to propel



STEAMER CURRIER, OF THE CUBA DISTILLING CO.'S FLEET, TAKEN IMMEDIATELY AFTER HER LAUNCHING FROM THE YARD OF THE FORE RIVER SHIP BUILDING CO., QUINCY, MASS.

the vessel at a mean sea speed of 10 knots per hour.

Altogether the Currier is a notable addition to the American merchant marine and on account of her adaptability to such varied trades as those mentioned should prove a valuable asset to the company operating her.

An Enviable Record

A letter of endorsement recently given by an official of the Isthmian Canal Commission to the operator who had charge of the eight Lidgerwood cableways used in building the Gatun locks during the preceding eleven months contains incidentally a remarkable record of efficiency of the cableways. This passage read as follows:

"These cableways so far as delays from breakage or repairs were concerned, while working 12½ hours per day, have been kept up to an efficiency of 99 per cent."

That is to say, that during this whole period only 1 per cent of time was lost on account of making repairs.

The cableways referred to are eight of the 13 cableways designed and built by the Lidgerwood Mfg. Co. for the Isthmian Canal Commission. The other five are used for handling the broken stone and sand for the concrete, taking it from barges and delivering it to the storage yards some 600 ft. away on the average. The total to be handled will be 2,000,000 cu. yds. of broken stone and 1,000,000 cu. yds. of sand.

The eight cableways for building the locks are used for placing the concrete and reinforcement and also for handling forms.

They are traveling cableways of 800 ft. span, operated electrically. They are handling on every working day more than 3,000 cu. yds. of concrete. Up to June 4, there had been placed in the Gatun locks and its auxiliary plant, 437,461½ cu. yds. of concrete. The amount placed in the five days from May 31 to June 4 inclusive was 16,809 yds., an average of 3,361 cu. yds. per day.

It is understood that the New England Coal & Coke Co., which three years ago began the transportation of its own coal in its own vessels, the Melrose, Malden and Everett, built for it by the Fore River Ship Building Co., is endeavoring to secure the fleet of the Boston Tow Boat Co., and has made an offer of $80 a share for the $1,250,000 worth of outstanding stock of the Tow Boat Co.

SHIP BUILDING IN THE UNITED STATES.

The bureau of navigation reports 376 sail and steam vessels of 95,137 gross tons built in the United States and officially numbered during the quarter ended Sept. 30, 1910, as follows:

	Wood. Sail.		Wood. Steam.		Steel. Steam.		Total.	
	No.	Gross.	No.	Gross.	No.	Gross.	No.	Gross.
Atlantic and Gulf	20	1,565	162	5,854	20	42,796	202	50,215
Porto Rico	..	.....	3	26	..	.....	3	26
Pacific	3	703	60	2,310	2	2,810	65	5,823
Great Lakes	2	55	45	821	17	36,942	64	37,818
Western rivers	..	.....	41	1,243	1	12	42	1,255
Total	25	2,323	311	10,254	40	82,560	376	95,137

During the corresponding quarter ended Sept. 30, 1909, 347 sail and steam vessels of 48,914 gross tons were built in the United States and officially numbered, as follows:

	Wood. Sail.		Wood. Steam.		Steel. Sail.		Steel. Steam.		Total.	
	No.	Gross.	No.	Gross.	No.	Gross.	No.	Gross.	No.	Gross.
Atlantic and Gulf	34	3,170	115	2,984	1	1,034	14	18,363	164	25,551
Porto Rico	3	17	1	8	..	.....	..	.....	4	25
Pacific	5	1,050	65	2,196	1	32	1	67	72	3,345
Great Lakes	..	.....	46	1,102	..	.....	8	17,327	54	18,429
Western rivers	..	.....	49	1,461	..	.....	2	103	51	1,564
Total	42	4,237	276	7,751	2	1,066	25	35,860	345	48,914

THE MARINE REVIEW

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Naval Department Cost Keeping

In the December issue of THE MARINE REVIEW we made extended reference to the circulars which had been distributed by the navy department regarding the proposed Meyer reorganization, saying in part:

One more point and we will leave the subject for the present. The reorganization contemplates the establishment of a modern and efficient cost system.

When this system is established at all navy yards, their work can be compared with similar work of outside firms.

THE MARINE REVIEW takes this opportunity to assert that the department will not do and has no intention of doing anything of the kind. There will be no cost system which will give the slightest indication of cost beyond possibly the labor pay roll and material invoices, and there will be no effort to establish anything more complete. There will be no items of overhead expense, salaries of line and bureau officers, interest on investment, taxes, insurance, depreciation, inspection, postage and telegrams, legal expenses, repairs and maintenance, or profit on product, and any so-called cost system, which does not show these charges in comparison with outside firms, with every one of which they are and must be taken into account, is nothing but a swindle and will fool no one but the department.

This was months before the naval appropriation bill was passed and which contained the following provision:

Provided further, That in fixing the cost of work under the various naval appropriations, the direct and indirect charges incident thereto shall be included in such cost.

In the past the cost of work in navy yards has not represented actual costs, as no overhead charges were included. Mr. Newberry, when assistant secretary of the navy, realized the importance of obtaining actual costs. He knew that the cost of work in the navy yards was outrageous and felt that the first step in effecting a remedy was to institute a cost keeping system which would show what the work really cost. This would enable comparisons to be made with the cost of work in commercial establishments and would show the navy yard costs to be far greater. With an accurate cost keeping system he would be in a position to force improved methods in the navy yards. He directed the paymaster-general of the navy, Admiral Rogers, to detail two officers to visit all of the best conducted commercial establishments to learn their methods and to prepare a cost keeping system for the navy. Admiral Rogers was already interested in the subject and he carried out Mr. Newberry's instructions fully. After complete investigation he prepared a cost keeping system which included in the cost of the output all proper overhead expenses.

The clique in Washington soon saw that this would not do. The results would bring about a reformation in navy yard work. The useless captains, commanders and other line officers, who did not add one iota to the efficiency of the plant would have to go. The soft shore berths would be taken from these officers and they would be forced to go to sea. This would never do. They set about to undo the good work started by Mr. Newberry and Admiral Rogers. They forced the retirement of the latter, and all of his assistants who had experience in this line of work were sent to sea. The cost keeping system was then taken in hand by Admiral Swift, the former aide for material. Very soon all the good work done by the paymaster-general was undone. The cost keeping instructions became a mass of contradictory orders. An order was issued one day to be revoked a few days later. Costs of any kind were impossible.

Certain members of the naval committee learned that it was the intention of Secretary Meyer and his aides not to include overhead charges in the navy yard costs. These members are interested in reforming navy yards. Congress is requiring private contractors to conform to the eight-hour day and at last the navy yards and the private contractors were to be on the same basis as regards hours of work. These members desired that a comparison should be made between the cost of work in the private yards and the government yards and to enable such a comparison to be made the provision was made in the naval appropriation bill that all indirect costs should be included.

Let us see how Secretary Meyer and his so-called "aides" are carrying out this law. THE MARINE REVIEW has secured a copy of the instructions for cost keeping issued June 21, 1910, by direction of the secretary of the navy.

This is a remarkable document in many ways. It displays everywhere ig-

norance of the subject and violates the very elements of accurate cost keeping. Perhaps, however, the most remarkable feature of this order is that the secretary of the navy confesses that he has no intention of obtaining the *actual cost* of the work in navy yards. This confession appears in one of the opening paragraphs of the order and is as follows:

> By the introduction of this system it is not the intention to obtain the actual cost of work from a commercial standpoint, but to more accurately distribute the expenditures to the proper appropriations as defined by law.
>
> For the purpose of obtaining the industrial cost of production it is essential to eliminate therefrom all expenditures of a military nature at navy yards. With this end in view, the following headings will be used for military expenditures:
>
> "Cost of Valuation" and "Maintenance and Repairs."

The law, as quoted above, requires that the costs of navy yard work shall include the indirect costs. Mr. Meyer is not carrying out these mandatory requirements of Congress. The law does not empower the secretary, his aides, or even the president, to make any classification of expenses as military or otherwise. The device is invented as a screen to protect the incompetents and place hunters. We give below a few of the more important indirect costs that are *not* included in the cost of work according to Mr. Meyer's "system."

1. Officers' salaries.—At all yards there are now a large number of officers and at the large yards the salaries of officers amount to from $130,000 to $200,000 a year.

2. The cost of clerical work.

3. The cost of draftsmen.

4. The cost of civilian assistants, subinspectors, expert aides, chemists, watchmen, messengers, etc.

5. Leave and holiday. Besides the usual holidays, 15 days' leave is granted to all employes who have worked a year.

6. Payments made on account of death or disability of employes.

7. Expense of receiving, testing and handling stores. No store-hand expense is charged.

8. Depreciation of plant.

9. Fire insurance.

10. Interest on money invested.

11. Taxes.

12. Repairs made to buildings, railways or plant machinery when such repairs exceed $100.

13. Cost of inspection department.

What explanation can be offered for not including these expenses in the cost of work? The navy department surely will not venture to contend that these are not indirect costs, in view of the universal practice to so consider them.

There is but one reason for excluding these expenses from the cost of work and this reason is that the *navy department does not dare let the country know the actual cost of work in the navy yards.* If the real costs are ever known, the downfall of the present system of naval administration is as certain as death.

The cost keeping instructions themselves are ludicrous. We have not space to comment on these, but we advise our readers to obtain a copy and see for themselves how the accounts of the millions spent by the navy are kept.

For example, repairs to buildings, plant, etc., which cost less than $100 are charged to the expense account, while if over $100 are not charged to the account. If it is desired that the expense accounts be high, the work is divided into a large number of small items, each less than $100, while if it is desired that the overhead charges be low, these items are bunched in one large item and charged elsewhere. This juggling of accounts is going on in every navy yard and will be recognized by those who have had dealings with government departments as another phase of the system of evasion followed in certain departmental transactions. Practically all branches of the service operate under a law which requires that all work costing over a certain figure must be advertised and let to the lowest responsible bidder and the way it is evaded is by cutting up a job into the necessary number of units or sections, each of which will come within the legal limit. In this way almost any job, especially repairs, can be placed wherever desired.

The labor for handling stores is charged to one naval appropriation, "Provisions, Navy," while the material used for the same job is charged to "Contingent, Supplies and Accounts." Actually the cost of handling a load of pig iron from store house to foundry is charged to the *appropriation for providing provisions for feeding the enlisted men on the ships.*

Since these wonderful instructions have been issued hardly a day passes that additions and modifications are not made to them. The accounts are in a hopeless tangle and no one who is in Mr. Meyer's confidence knows how to straighten out the tangle.

The statements which have been made by THE MARINE REVIEW can be verified by the navy department's own files. When the time for a real investigation comes we are prepared to prove our case. Will it ever come?

In Darkest Washington

For nearly three years THE MARINE REVIEW has persistently opposed and criticized the methods, or lack of method, in the administration of the navy department and has devoted much time to quiet investigation of yards and bureaus and our pages are rich in evidence of the extravagance and incompetence developed thereby.

That others are beginning to take note of the situation witness the following abstract of an utterance by the *American Machinist* on "Progress Toward Good Shop Management:"

> It is gratifying to note the advance that has been made in recent years in shop management. We shall not quibble as to whether we should use the term "scientific management" or "good management" as long as all are working to the same end, that is, the best work for the purpose in the quickest time at the lowest cost, with good wages to those who produce these results. * * * * * * * * * *
>
> It has also been well demonstrated that management and shop direction must be in the hands of those who have been educated for the work and who have had years of experience in the line. Year by year management becomes more nearly a science. This is almost axiomatic and it would appear needless for us to invite attention to this, were it not that we had to record one important exception to the record of progress of good management.
>
> The naval authorities, in the administration of navy yards, have violated the very elements of good management. Men whose lives have been spent at sea under naval discipline, who had no experience in industrial management and who have little or no knowledge of shop conditions or shop methods, are placed not only in control of the administration of the industrial works, but also in immediate charge of important shops. It

seems needless to point out that this must inevitably result in very low efficiency, and a large waste of public money, and may seriously impair our national defense. It is inconceivable that such conditions should exist and we hope that immediate steps will be taken by the naval authorities to remedy these conditions.

There is no better or higher authority on the subject; no journal in the world more closely in touch with shop methods and management than the *Machinist.* It might well also have drawn attention to the fatuous policy of the department of removing or degrading every man who has given evidence of possessing any greater practical knowledge or executive ability than the academy cubs and seagoing officers who now swarm in every navy yard.

Another Document in Evidence

Navy Yard, Puget Sound, Sept. 28.—Navy yard officials have been assured beyond doubt that the big cruisers Colorado and Pennsylvania will come to this yard this winter, and preparations are being made for extensive repairs to these two ships. It was announced today that the two warships will arrive here the latter part of November, and that they will remain at this yard until next May or June.

The work on these ships will probably cost $1,000,000. New boilers are to be installed in place of those now in use, which are of an obsolete type, and the boilers and engines will undergo a thorough overhauling. The new style of skeleton masts will be installed fore and aft, and this will necessitate a change in the fire control systems of the two ships. The work of removing the massive steel masts and installing the new type is a big piece of work in itself.

The Colorado and Pennsylvania are now at the centennial celebration at Valparaiso, Peru, and will come north at its close.

These ships will not take part in the fall target practice but will come to this yard as soon as practicable for repairs.

The arrival of these ships at the navy yard and the employment of several hundred skilled workmen, together with the 1,700 sailors on these two ships and the money spent in wages, material and supplies, will give Bremerton one of the busiest winters in her history.

The Colorado and Pennsylvania have only just left the Bremerton yard (about Aug. 10) after an overhauling extending over more than 4 months and during which extensive repairs were made to boilers and engines. They have crawled as far as Valparaiso and must now after two months service, return to be overhauled again! They could not even take part in target practice!

Both ships have only been in commission a little over five years. They left the yards of the builder early in 1905 after exceedingly satisfactory trials during which both exceeded their contract speeds, and one without even a preliminary trial, and the "obsolete" boilers, as certified to by naval officers detailed for the trials,[1] made more steam than was required and "were blowing off during practically the whole run." The boilers are of the Niclausse type, built by the Stirling Co., Barberton, O. However, the act of gracefully swallowing oneself, or even his fellows, has been heretofore pointed out as one of the accomplishments of a United States naval officer, as, witness the following extracts from the report[2] of a board of engineer officers detailed to make a series of tests of the boilers at the works of the maker:

> The following tests of a Niclausse boiler of the improved marine type were made at the works of the makers, the Stirling Co., at Barberton, O., by a naval board, consisting of Captain J. A. B. Smith, U. S. navy; Commander W. B. Bailey, U. S. navy, and Commander W. M. Parks, U. S. navy.
>
> The principal object of the tests was to determine whether the proportions of the boiler were such that it could be forced to a high rate of coal combustion without injury. Careful data were also taken to determine the efficiency of the boiler at the various rates of combustion.
>
> The board first carefully examined the boiler to be tested, and inspected the arrangements made for the tests. * * *
>
> Before beginning the construction of the boilers for the battleships Virginia and Georgia and the armored cruisers Colorado and Pennsylvania, the resources of the Stirling Co. were freely used in elaborate experiments to find out the proper proportion of headers, nipples, steam drums and other details for this type of boiler to render it safe and economical under conditions of forced draft. The important question of baffling was also investigated. The result has been the production of a boiler that retains little of the foreign type, save the principle and the general outline, and a boiler that these tests show to be safe, economical and durable under forced-draft conditions.

Now these durable boilers which have not been under actual steam conditions, to say nothing of forced draft conditions, one half the time since they were built, are to be scrapped, when they ought to be as serviceable as ever and for another 10 or 15 years.

[1]Journal American Society Naval Engineers, November, 1904; February, 1905.

[2]Journal American Society Naval Engineers, 1904.

THE MARINE REVIEW holds no brief for any type of boiler and merely quotes the department's own records and reports to prove the incompetence and extravagance running riot in the navy, but takes the opportunity to say that boiler design and boiler performance are today substantially what they were when these reports were made and the Colorado and Pennsylvania were built and that the results of these tests, as stated in the board report quoted above, show the boiler efficiency to have been very high indeed, the corrected evaporation per pound of dry coal running from 11.85 lb. with air pressure of 0.5 in. to 10.19 lb. with 2.66 in. air pressure and that so few boilers, "obsolete" or otherwise, ever do better, that claims of higher duty are looked upon with strong suspicion.

It is to be hoped a kind providence may long postpone the day when we need to look to our navy for anything more than helping to make a holiday. However, with engineer officers who don't know a boiler from a galley range and whose only idea of engine room service is that it is a beastly bore and that it ought to be abolished entirely, what else is to be expected? And then a navy yard is a whole lot more comfortable than being at sea and whether one has any experience or knowledge or not makes no difference; Uncle Sam is a good, as well as a tolerant, paymaster.

Lieut Edison E. Scranton, of the navy, has been tried by a court martial and sentenced to a loss of ten numbers in his grade and this sentence has been approved by the navy department. The officer was engineer officer of the Indiana during a midshipmen's cruise abroad and the machinery of the vessel was damaged by reason of *some tools having been left in one of the engine cylinders after the cylinder had been opened for repairs.*

The United States life-saving tug Snohomish is being repaired at The Moran Co.'s yard, Seattle. The work includes an extension of the upper deck for better protection from the seas found at the entrance to the Straits of San Juan de Fuca, where the Snohomish is stationed.

Influence of the Erie Canal

Editor MARINE REVIEW:—It is now confidently reported that the New York State barge canal will be finished for the opening of the season of 1914,at least a year sooner than was at first supposed to be possible. The work is progressing at a rapid rate, so that the payments to contractors are getting to be over $1,000,000 a month and increasing fast. This sets the transportation people and heavy shippers to figuring on the probable method of handling the new canal as a continuation of the lake route. Of course, nobody is trying to adapt lake craft to the new conditions. The new barge must be cheaper and lighter than anything of that sort. It has always been a great point in canal traffic that the conveyance may be of much less cost than its cargo, which is not true of lake craft to any extent and not often in rail traffic, nor even of a lumber wagon sometimes.

It is this fact more than any other that will make it profitable to reship the lake cargoes at Buffalo, though back of that the hard work done in Buffalo for the canal was that the city interests alone, as a manufacturing center and not as a transfer point, demanded the cheap waterway. The through traffic will be welcome and taken care of, but that is an incident now. Buffalo is filling up with iron furnaces and manufactories that are resultants of them, so it is now stated that a single iron concern here, with six furnaces for the production of pig iron, is figuring on a canal fleet, though it has not gone far enough yet to settle the question whether it will pay to build a fleet of the present-size boats for the three seasons that are between this and the new canal or to wait and put on a fleet of 2,000-ton barges for 1914. This will be done at any rate, the idea being that a steamer with five consorts is the proper figure.

The old lake package-freight lines are not going to let the traffic on the new canal go to individuals, though. They feel quite safe for the most part in their notion that they can control the traffic for the most part. They have the terminals, as nobody else has, and four of them, the New York Central, Erie, Lehigh Valley and Anchor line, maintain canal fleets now, leasing the boats. They admit that the business is not satisfactory, but they will stick to them and then expand them into 2,000-ton capacity as the new canal comes in. It will be easy to do that. It is figured that a barge-canal steamer capable of towing five others, the fleet together carrying close to 12,000 tons, will cost $40,000 and the barges a matter of half that amount. The cost is too great for individuals to take up, unless they stand very close to the big rail lines.

There are still bitter enemies of the barge canal down the State, who hold that it was a piece of folly to try to revive that traffic, though jealousy of Buffalo has animated much of the opposition. Still if the new barge will reduce the rate of freight one half, it will give Buffalo and the route entire an advantage that no other interior point can approach. It is believed that it will do just that thing. Buffalo is now receiving its ore from the lake steamer to the furnace direct and the Niagara river is steadily adding to its capacity. Two new smelting furnaces will be added by the Rogers-Brown Iron Co. next season, there being close to 20 of them now on the Niagara Frontier.

It is a great source of pride and distress at the same time to note that the harbor side of Buffalo is already getting to be terribly smoky. The timid citizen is moving farther and farther northward to get out of the line of smoke and the lake vessel owner and business man generally is rubbing his hands and asking for more smoke, for that means more business. The iron industry is not only here to stay, but it is growing fast and at the same time has merely begun to grow. From being a small ore receiver a few years ago, the port is one of the four largest in that line on the lower lakes.

Friends of the canal already see it beginning to restore the line of flourishing villages and cities that the old canal created during the first half of last century, but only to see a great part of them get out of step in late years and stand still, waiting for another boost. It has seemed that the State owed them something and now it is trying to pay that debt. It is true that the competition by rail is greater now than ever before, not only in actual rates, but in dispatch, which is a great matter. The lake lines state that they are carrying flour from Minneapolis to New York, by lake-and-rail, in six and one-half days, and that they can do it right along when conditions are normal. This means so much less of the delay that has always attended the rail traffic.

Of late years the canal has been doing quite well. The fleet has been reduced so that the traffic does not any longer make much showing as against the rail lines, but it has modified rates always and it always will, so long as there is a boat doing business. It has carried about 8,750,000 bushels of grain this season, which is an increase of over 1,000,000 bushels every year lately. With a stir attendant on getting ready for the enlarged canal, the traffic will grow steadily till that time.

JOHN W. CHAMBERLIN.

Contract for Car Ferry

President James C. Wallace of the American Ship Building Co. closed contract on Sept. 17, with the Pere Marquette Railroad Co. for a car ferry to replace Pere Marquette No. 18, which foundered on Lake Michigan. As the contract calls for her delivery on Jan. 15 next she will be built on Lake Michigan and the yard at South Chicago has been opened for that purpose. It will be observed that under the terms of the contract this car ferry is to be built in practically ninety working days, which is a very considerable performance.

The new car ferry will be 350 ft. long, 56 ft. beam and 19½ ft. deep. This is the third order for car ferries that has been placed in lake yards during the present year. The American Ship Building Co. recently delivered Marquette & Bessemer No. 2 to the Marquette & Bessemer Dock & Navigation Co. at Conneaut.

The Toledo Ship Building Co. is building a car ferry for the Ann Arbor Railroad Co. for service between Frankfort, Mich. and Manitowoc, Wis. She will be delivered in December.

Car Ferry Design

It is intimated that the railway companies operating car ferries in the open lake are arranging to have tightly fitting hoods placed on the hitherto open sterns of the vessels. This action is traceable to the recent loss of car ferry Pere Marquette No. 18 with the sacrifice of 28 lives. The subject of car ferry construction will also be discussed at the next annual meeting of the board of supervisors of the Steamboat Inspection Service in Washington next January. Concerning this C. H. Westcott, supervising inspector with headquarters at Detroit, says:

"In addition to the closely fitting hood on the stern I shall advocate the closing of all deadlights on the under side of the vessel, either by eliminating these openings altogether, or by placing over them a covering which shall extend to the height of the upper deck, the top being left open for ventilation. If deadlights on the outside are done away with, they could be replaced by an artificial system of ventilation in the hold of the steamer or by ventilator holes through the middle of the longitud-

inal section of the main deck, placed in line with the smokestacks and equipped with a covering, the top of which shall be at least as high as the upper deck level.

"It seems to me a change also should be made in the ventilators opening on the main deck from the engine room. On most of the car-ferries these openings are located in the sides of the ship. They have no other covering than an iron grating and the edges are protected only by a 3-in. coaming.

"I will recommend that these ventilator openings be removed to the space in the longitudinal section of the deck, between the tracks, and in line with them and that they be inclosed by a sheet iron covering with the top extending as high as the upper deck, or that some other equally good system of artificial ventilation for the engine room be substituted for them."

Steamer New York Founders

The old wooden package freight steamer New York, commanded by Capt. Moses W. Humphrey, of Detroit, foundered off Thunder bay, Lake Huron, on Oct. 2, after an all night struggle against a heavy sea. She was towed to Owen Sound with a cargo of 2,000 tons of coal. When it became certain that the New York had foundered the captain ordered the crew to the yawl boats and all got away from the sinking steamer safely. They were later picked up by the steamer Mataafa and taken to Port Huron. Capt. H. J. Regan of the Mataafa says that he was greatly aided in picking up the wrecked seamen through the liberal use of storm oil which quieted the seas as the yawls approached. The New York was not insured. She was built in 1879 for the Erie Railroad Co., but was sold several years ago to the New York Steamship Co., of Detroit.

Iron Ore Shipments

Notwithstanding the great subtraction of tonnage from the active fleet, ore shipments during September passed the 6,000,000 mark, being 6,273,832 tons. This is a decrease of 771,153 tons over the movement during September, 1909, and is a decrease over the August shipments of the present year of 690,549 tons. August in itself showed a decrease of 228,818 tons over July, so that the movement of ore has sensibly fallen during the past two months. This slump will probably be accelerated from now on, as vessels are fast going to dock. The Pittsburg Steamship Co. is through with quite a great deal of its chartered tonnage and will be through with the balance within a week. In October, 1909, the fleet moved 6,625,801 tons, which, it will be seen, is somewhat more than was moved in September of the present year. It is not expected that the October movement will reach the figures of 1909, though the total movement for the season will show quite a respectable increase over that of 1909. The increase to Oct. 1 is 5,461,331 tons. During the remaining months this lead will be cut down somewhat. However, it is practically certain that the total shipments for the year will be between 46,000,000 and 47,000,000 tons. Following is the summary:

Port.	Sept., 1909.	Sept., 1910.
Escanaba	948,951	705,801
Marquette	565,949	439,442
Ashland	721,236	557,858
Superior	1,057,175	1,256,665
Duluth	2,133,800	2,041,908
Two Harbors	1,623,874	1,272,158
Total	7,050,985	6,273,832

1910 decrease, 777,153.

Port.	To Oct. 1, 1909.	To Oct. 1, 1910.
Escanaba	4,002,796	3,868,072
Marquette	1,979,517	2,689,219
Ashland	2,422,004	3,436,829
Superior	4,743,498	6,484,352
Duluth	9,847,177	11,865,552
Two Harbors	6,644,541	6,756,840
Total	29,639,533	35,100,864

1910 increase, 5,461,331.

The season on the great lakes will end very quietly, more quietly than for many years, the closing weeks offering no attractions to anyone. The ore movement is entirely cared for by contract ships. Wild vessels that take coal up have to return without cargo and there is certainly no money in carrying a tonnage of coal to the head of the lakes for 30 cents and coming back light. The season will definitely close on Nov. 30, after which time no ships will leave port. As for the grain trade there is nothing in it, the rate from Duluth being 1 cent and even less than that from Chicago.

September Lake Levels

The United States Lake Survey reports the stages of the Great Lakes for the month of September, 1910, as follows:

Lakes.	Feet above tide-water, New York.
Superior	601.99
Michigan-Huron	580.30
Erie	571.86
Ontario	245.70

Lake Superior is 0.03 foot higher than last month, 0.41 foot lower than a year ago, 1.05 feet below the average stage of September of the last ten years, 1.83 feet below the high stage of September, 1876, and 0.50 foot above the low stage of September, 1879. It will probably remain about stationary during October.

Lakes Michigan-Huron are 0.05 foot lower than last month, 0.50 foot lower than a year ago, 0.73 foot below the average stage September of the last 10 years, 3.13 feet below the high stage of September, 1876, and 0.55 foot above the low state of September, 1896. They will probably fall 0.2 foot during October.

Lake Erie is 0.21 foot lower than last month, 0.48 foot lower than a year ago, 0.55 foot below the average stage of September of the past ten years, 2.06 feet below the high stage of September, 1876, and 0.60 foot above the low stage of September, 1895. It will probably fall 0.3 foot during October.

Lake Ontario is 0.35 foot lower than last month, 0.58 foot lower than a year ago, 0.47 foot lower than the average stage of September of the last ten years, 1.67 feet below the high stage of September, 1883, and 1.70 feet above the low stage of September, 1895. It will probably fall 0.4 foot during October.

Commerce of Lake Superior

The commerce of Lake Superior as measured by the canals of Sault Ste. Marie, totaled 8,790,374 tons during September, which is a falling off of 954,182 tons from the movement of the preceding month. The movement to Oct. 1, however, shows an increase of 9,797,726 tons over the corresponding period of 1909. Following is the summary:

EAST BOUND.	To Oct. 1, 1909.	To Oct. 1, 1910.
Copper, net tons	79,891	95,653
Grain, other than wheat, bush.	18,284,176	25,202,054
Building stone, net tons.	1,129	8,365
Flour, bbl.	3,828,826	4,766,452
Iron ore, net tons	28,107,722	34,282,282
Pig iron, net tons	21,411	23,411
Lumber, M. ft. B. M.	394,973	472,614
Wheat, bus.	40,279,688	40,771,839
Unclassified freight, net tons	108,029	119,793
Passengers, number	27,157	29,483
WEST BOUND.		
Coal, anthracite, net tons	916,740	1,209,289
Coal, bituminous, net tons	6,122,058	8,896,296
Flour, bbl.	2,355	1,110
Grain, bush.	1,000	2,153
Manufactured iron, net tons	323,950	289,519
Iron ore, net tons	13,108	.....
Salt, bbl.	483,967	427,248
Unclassified freight, net tons	634,080	871,261
Passengers, number	28,342	32,711
SUMMARY OF TOTAL MOVEMENT.		
East bound, net tons	30,957,325	37,507,279
West bound, net tons	8,082,123	11,329,895
Total	39,039,448	48,837,174

The total number of passages to Oct. 1, 1910, were 16,115, and the net registered tonnage, 39,634,123.

ELECTRO-MAGNETIC TRANSMISSION FOR MARINE PROPULSION*

By Jules Lecoche.

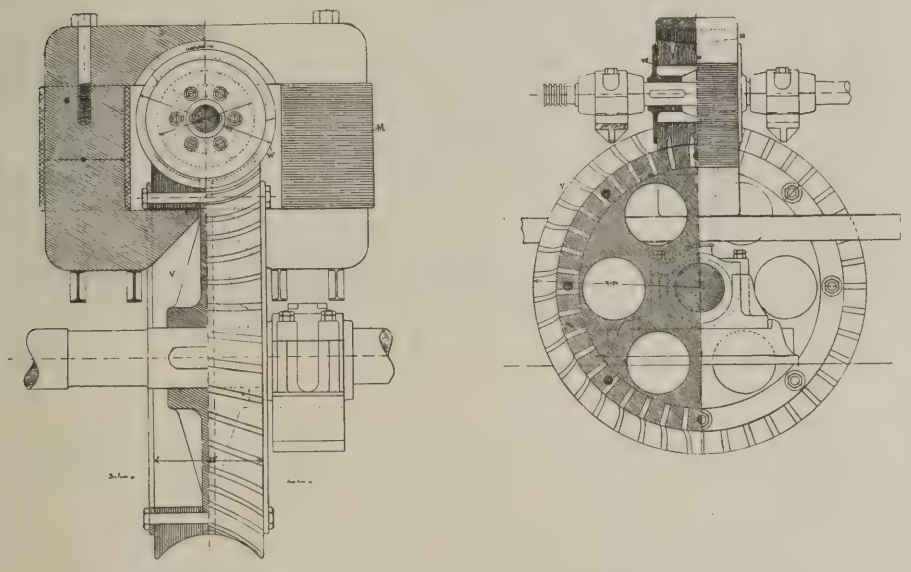
IT IS now generally admitted that the combination of a reciprocating engine with an exhaust steam turbine provides the most satisfactory solution of the problem of marine propulsion, whenever a high efficiency is of paramount importance. However, when he comes to put this principle into practice, the marine engineer is soon confronted with a number of difficulties which, while not actually insuperable, are only got over at the cost of both the efficiency and simplicity of the arrangement.

The use of two propellers driven by the reciprocating engine and by the turbine respectively need hardly be taken into consideration on account of the great difference between the speed and brake horsepower of both machines. Under these conditions, the only solution lies in an arrangement whereby the power of the turbine is transmitted, at a suitably reduced speed, to the main, or reciprocating engine shaft, so as to assist the latter in the propulsion of the ship. A mechanical speed-reduction gear suggests itself as the simplest realization of this arrangement. However, it must be remembered that, under certain conditions of the sea, the reciprocating engine of a boat shows a marked tendency to race; a tendency which is by no means equally shared by the turbine.

Difficulties of the Problem.

If, therefore, the connection between both machines is effected by means of the usual system of gearing, the teeth of the latter will in all probability be stripped off, as soon as, from some reason or other, the resistance on the main shaft is appreciably reduced. If to this we add the noise, vibrations, wear and tear and the comparatively low efficiency of mechanical gearing for such high ratio as 3,000/75 R. P. M., it will be reasonably admitted that no mechanical gear can afford a satisfactory solution of the problem before us. Other means for transmitting power and simultaneously reducing the speed are the hydraulic and electrical transmissions, both of which have been tried in connection with marine propulsion. The former alternative, as conceived at present, can hardly be expected to meet the requirements of the marine engineer on account of its comparatively low efficiency, excessive wear, weight and cost. The second alternative, namely, the electrical transmission, appears very attractive from the point of view of flexibility and ease of control. However important these factors undoubtedly are, other conditions must be complied with before an electric transmission can be conveniently adopted for the purpose in question.

The first of these conditions is a high efficiency. In speaking of this system as a "transmission," one is apt to forget that the actual transmission is only part of the process, the latter being essentially a "transformation" of mechanical power into electrical energy, and again of electrical energy into mechanical power. Taking into consideration the individual efficiency of each single element (generator and motor) of this transmission, it will be found that the combined efficiency cannot be very high, especially when the motor is designed to run at such low speed as 75 R. P. M. Other serious drawbacks of this system are the weight and cost of the slow-running electric motor and also the necessity of resorting to high tension voltage, the presence of which is more or less unwelcome aboard ships.



300-H. P. Magnetic Gear, Speed 3000/75.

Application of Magnetic Gear.

The application of the "magnetic gear" to marine exhaust-steam turbines was suggested on account of its high efficiency, noiselessness, positive drive, cheapness of upkeep (there being no wear and no need for lubrication, except in the bearings) and, last but not least, on account of this valuable peculiarity that, as soon as the reciprocating engine begins to race, the transmission comes automatically out of gear, thus effectively protecting the machinery against injury. Compared with both dynamo and motor, the magnetic gear has the advantage that it requires only a nominal amount of electrical energy. In fact, the latter is only an accessory, and the current being of comparatively low voltage can usually be supplied by the existing lighting sets. Although the simplicity of construction and action of the magnetic gear is almost suggested by the name itself, I think a brief description of the machine may be found of interest.

The illustration shows a magnetic

*Read at the Naval and Enginering Exhibition, Olympia, on Saturday, Sept. 17.

frictionless gear of the screw type for an exhaust-steam turbine of 300 B. H. P. running at 3,000 revolutions per minute; through this gear the power of the turbine is transmitted to the main propeller shaft driven by the reciprocating engine at a speed of 75 revolutions per minute. Such a high speed reduction is possible in this case, owing to the fact that the absence of friction between the working parts allows such high circumferential velocities as would be quite unpracticable with mechanical gearing; besides, apart from the bearings, there is no need for lubrication, and this is a point not to be depised. Unlike an electric motor, the revolving parts of the magnetic gear carry no winding whatever, so that the empty slots and helical grooves of both wheel and worm provide for a perfect cooling. The three main parts of the gear are: The field magnet M, the laminated worm W, the wheel V.

The Field Magnet.

The field magnet, made of cast steel of high magnetic permeability, is of the Manchester type; its top pole-piece is laminated in order to prevent losses and heating from hysteresis and Foucault currents. The coils are wound with high conductivity copper wire properly insulated. The worm is made up of iron stampings fixed concentrically on two cast iron spiders, in exactly the same way as the armature core of a motor or dynamo. One end of the worm shaft is coupled to the turbine. The end-thrust is either entirely or partially balanced by that of the turbine. A thrust-bearing is shown at the other end of the shaft to take the unbalanced thrust. The wheel, being subjected to a side-thrust due to the angularity of the teeth, partially relieves the thrust-blocks of the propeller shaft. The wheel V has a hollow rim made up of sprockets of soft iron coarsely laminated; these sprockets have the same angle, width and pitch as the threads of the worm opposite which they move with a clearance of about ¼ in. This wheel is keyed on the propeller shaft driven by the reciprocating engine at 75 revolutions per minute. To clearly understand how the tangential pull on the rim of the wheel is obtained by means of apparently perpendicular lines of force it must be pointed out that the latter are not actually normal to the circumference of the wheel, but owing to difference in the degree of saturation of the iron sprockets due to a slight advance of the worm threads under load the lines of force cross the air gap at an angle, dragging the wheel in the same way as the armature of an electric motor is pulled back into the field when shifted along its center line.

Losses in the Magnetic Gear and Speed-Reduction.

The transmission losses are, the electrical energy necessary for exciting the magnetic field and the hysteresis and Foucault-currents in the iron of the worm and wheel.

Field Excitation.

From experiments I have made, I found that a magnetic density of 15,000 lines per square centimeter are required to give a tangential force of 22 lb. per sq. in. of iron face. With a total air-gap of one centimeter, a number of ampere-turns equal to $800 \times 15 = 12{,}000$ is required for producing the necessary magneto-motive force; as there are two parallel magnetic circuits (wound in series) it will really be 24,000 ampere-turns, to which we must add 6,000 ampere-turns to overcome the resistance of the iron circuit, and this brings the total to 30,000 ampere turns. Let us now assume that the pressure of the electric supply is 120 volts, that the wire with which the coils are wound has a sectional area of 0.012 sq. in., to which corresponds an ohmic resistance of 0.2 ohms per 1,000 yd., and that we allow a current density of 1,000 amperes per sq. in., say 10 amperes for the section of our wire; then, 3,000 turns of such wire will be necessary to give the 30,000 ampere turns required. The length of each turn of wire being 2 yd., the total length of the electric circuit will be 6,000 yd., whose total resistance (at 2 ohms per 1,000 yd.) is 12 ohms. The formula $R = I = E$, in which R is the resistance of the circuit, I the intensity of the current, and E, the electro-motive force, is verified; 12 ohms $\times$ 10 amperes $=$ 120 volts. The total electrical energy corresponding to these figures is: 10 amperes $\times$ 120 volts $=$ 1,200 watts, which is less than 1 per cent of the total power transmitted (300 H. P.).

Loss Through Hysteresis and Foucault Currents.

Owing to the laminated state of the worm, and also the sprockets of the wheel, the loss through eddy-currents and hysteresis is very low and always less than 4 per cent of the total power, which, added to the 1 per cent of the field excitation, will give a total transmission loss of 5 per cent.

The total weight of the 300 B. H. P. gear for reducing the speed from 3,000 to 75 revolutions per minute is 11 tons, of which 2 tons for the worm with its shaft and bearings, 4 tons for the wheel and 5 tons of the field magnet. Comparing these figures to electrical transformation, it would be in the latter case: One 250 K W dynamo at 3,000 R. P. M., 3 tons (approximately); one 300 H. P. motor at 75 R. P. M., 27 tons (approximately); total 30 tons. The magnetic gear can run in both directions if the turbine is reversible, if such is not the case, the excitation is cut off by means of a switch, and the reciprocating engine gives alone the reverse motion without the assistance of the turbine.

Aerial Navigation

Editor MARINE REVIEW:—It would not be at all surprising if navigation among the clouds should soon pass beyond the experimental stage and as now being freely prophesied by many that such aerial vehicles will become mighty engines of destruction in times of war, being a method that any nation may adopt and put into operation upon slight provocation, invading any country by day or night, dropping most terrible explosives into great cities with the most destructive effects. One can scarcely imagine any limit to the train of evils that would follow such a system of avenging a real or fancied wrong and inaugurating a system of destruction for outside the bounds of so-called "civilized warfare." In view of the rapid development in the science of traveling through space at a desired height with its threatening possibilities and even probabilities, such conditions may speedily bring about an alliance between the principal nations of the earth declaring for arbitration of all international questions, clothing itself with ample power to enforce the declaration, and thus turn this threatening engine of destruction into a channel that will entirely reverse its operation and effect so as to work out the problem of universal peace between the nations of the earth through sane and civilized arbitration. JAMES STONE.

Cleveland, Oct. 10.

The steamer Felix Carbray, formerly the John C. Gault, owned by F. B. Chesborough, Emerson, Mich., will go to the coast this fall.

A NEW DESIGN OF GRAB BUCKET

THE accompanying illustrations show quite clearly a type of grab bucket which has been perfected after trials and experiments extending over two years by the Andresen-Evans Co., Chicago, for handling all kinds of bulk materials, more especially iron ore, cement clinker, coal, etc.

Up to within the past few years the greater proportion of plants for handling bulk materials, and coal in particular from ship to storage, have been very much of one type, consisting of hoisting towers equipped with double drum engines handling the commonly known clam-shell buckets. Improvements made within the last 10 years in ore handling and storage equipment have also affected the practice in handling coal, and results that were considered satisfactory with the old type hoist and 1½ to 2-yard capacity clam-shell buckets are not acceptable to present day management.

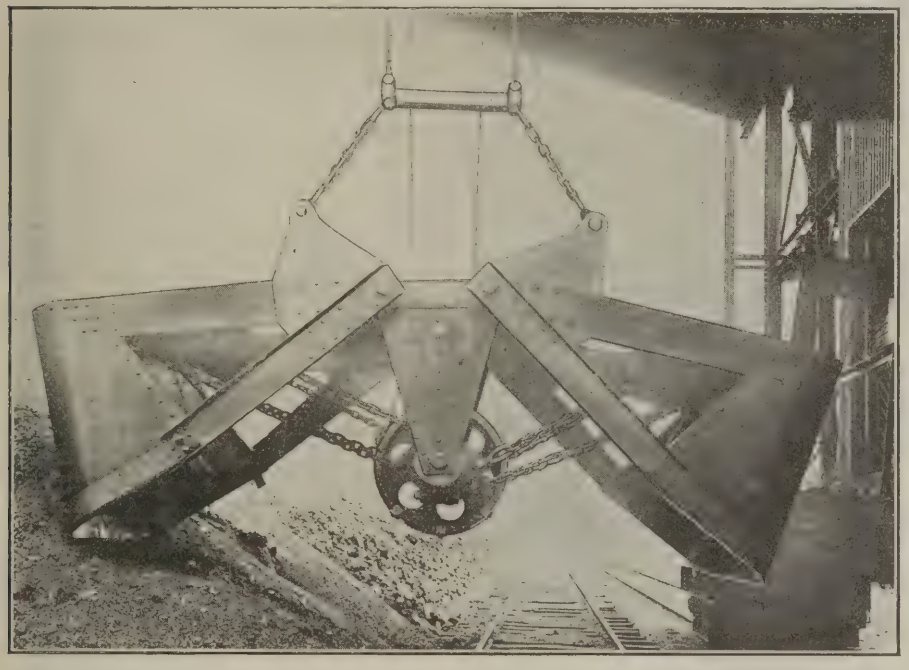


FIG. 1—SEVEN AND ONE-HALF-YARD, TYPE A, COAL BUCKET ON CONVEYOR BRIDGE, OPEN.

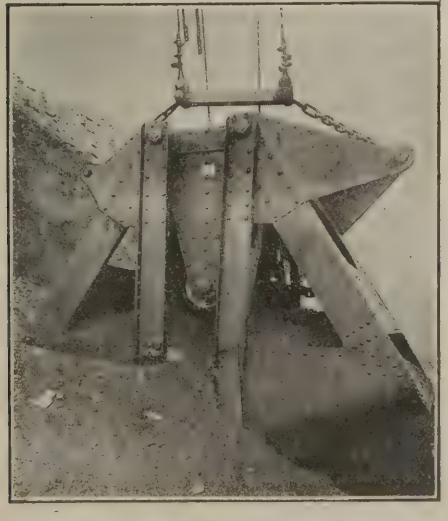


FIG. 2—SEVEN AND ONE-HALF-YARD BUCKET, HANDLING POCAHONTAS COAL, DIGGING IN SIDE HILL.

In some respects a resemblance will be noted to other types of buckets, including the differential drum, but in most others it differs from all other types. One of the essential differences to be noted is that the differential drum is mounted in a separate central frame, which also carries the bearings for the hinge shafts on which the scoops are pivoted. Another difference may be noted in the transmission, in which four two-part chains are used. The common complaint of operators of older types of grabs is that the buckets will not fill to capacity except in hard coal or the easiest-digging kinds of mine-run soft coal, and the latter only after the bucket has been dropped from 15 to 20 feet to obtain penetration. In unloading ships this practice has been productive of great damage to both buckets and ships, and large bills have been attendant upon the severe treatment, but the greatest damage from a financial standpoint is due to the excessive breakage of coal and the resultant increased amount of slack or screenings. With these buckets, the maker's claims are that it will fill to its rated capacity in all such hard-digging coals as splint, black-band, etc., and that it will work equally well in free coal, side-hill, hatch or winging.

As will be noted from the illustrations, this new grab has, in common with the more familiar clam-shells, a main differential drum for closing, but here the similarity ends, for the drum is not pivoted on an extension of the scoops but, as already noted, is carried by a separate central frame in which the hinge shafts also have their bearing. In this feature of separate pivots for the scoops this bucket differs also from the clam shells, and this is an element in more than one way in securing the good digging results obtained; first it gives an exceedingly wide opening, over 50 per cent greater than the clam shell, and second it gives with a simple motion the peculiar digging path and the cutting edge that is obtained in other buckets by the use of separate pivots for front and back of each scoop. This advantageous cutting path, combined with the long reach, insures a full bucket, even in cleaning up where the material is somewhat scattered.

The closing action is produced by four closing chains, seen in the illustrations, pulling in a direction practically parallel to the line of resistance and working against this resistance with a long lever arm, securing thereby a most powerful closing effort, and

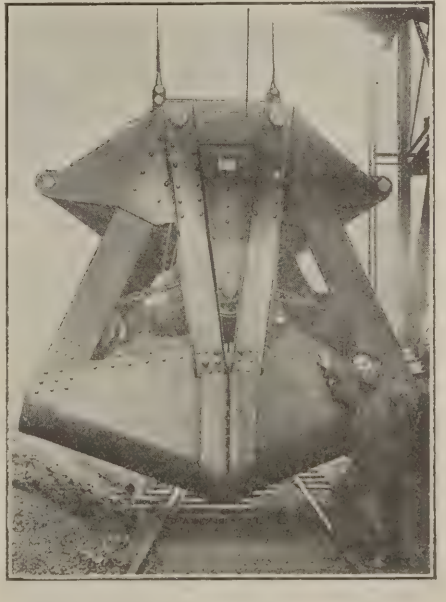


FIG. 3—SEVEN AND ONE-HALF-YARD BUCKET, CLOSED.

FIG. 4—THREE-YARD, TYPE A, BUCKET ON COAL HOIST, UNLOADING SHIP.

entirely without the use of compound motions.

With the older types of clam shells, it is claimed that only a portion of the weight of the grab is effective in opening and that a large portion is carried directly by the opening line, including the top frame and brace links and a considerable portion of the weight of the scoops. In the Andresen-Evans grab, not only all of the weight is carried by the opening line but this weight is effective in opening, due to the positive pull caused by the toggle action on opening chain and which results from simply releasing the brake on the closing line.

With the flat path followed by the scoop jaws in opening, it is not necessary to hold the grab high above the hopper or stock pile when dumping. In fact, when delivering to stock pile, it is possible to lay the coal on the pile without altering the usual method of operation, thus eliminating another factor in coal breakage. When open the center of gravity of the bucket is low down and it is possible to work successfully on the side of a pile, there being little tendency to tip over. In this position also, the head room required is small and it is therefore easily swung between the decks for winging or cleaning up between hatches or for clearing out track hoppers, bins or similar spaces where superstructures prevent direct vertical digging. In marine work this feature is of special value, as the wide opening enables the grab to reach well from one hatch to another and eliminate most if not all hand shoveling.

Since economical operation demands that the weight of material handled shall bear a high ratio to the gross weight, special effort has been made to secure maximum capacity with minimum weight of construction, and it is claimed that in this bucket the proportion of net load is higher than in any other.

Of course the same advantages with respect to digging, clearing out and net load are true in the case of ores and other materials as well as with coal. The type A bucket described herein is designed for two-line operation. Type B is for three or four-line operation, and both are built in three different weights for each size, ranging from 1 to 7½ cubic yards.

Trade Shows Improvement

H. E. Moss & Co., of Liverpool, in their semi-annual steamship circular, have the following to say concerning trade in general:

Since the issue of our last semi-annual steamship circular, the unexpected has again happened. There was a marked improvement in the prospects of steam-shipping during the early months of this year; freights had sensibly advanced, especially from the east, and were on a payable level.

Unfortuntely, there has been what we hope is only a temporary set-back, the result, in our opinion, of two main factors—the principal one being the unexpected failure of the harvests in La Plata, which suddenly necessitated over 100 large steamers being forced to seek employment in other directions and causing a general decline in freights; the other factor may be attributed to the troubles at home in the coal trade (now happily ended) which contributed largely to the dislocation of business, and delayed the improvement we had all expected. The coming harvests, at home and abroad, it is anticipated will this season be most bountiful, and it is hoped, with cheaper breadstuffs and the continual increase in the volume of our trade, we may look forward to a gradual improvement from this autumn onwards.

The amount of tonnage under construction in the United Kingdom is large. According to Lloyds' returns for the quarter ending March 31, 1910, it amounted to 1,057,636 tons compared with 912,272 tons for the corresponding quarter of 1909, and there was also a similar increase, say about 150,000 tons, as compared with the same period ending Dec. 31 last. For the quarter ending June 30 we anticipate the tonnage under construction will prove to be about the same as on March 31. These figures are much less than they have been in former years, but are still too large for present requirements, as the amount of tonnage launched from Jan. 1 to March 31 this year was about 50 per cent greater than for the correspond-

ing period of last year, and we expect will maintain the same level up to June 30.

Large numbers of contracts, principally for liners and special steamers, were placed during the last six months, the low cost of construction tempting many owners to reconstruct their fleets, but at present the demand has practically ceased and, while some builders are fairly well off for work, there are many very keen for orders, and contracts can be placed today practically as cheaply as they have been recently; but this cannot remain for long, as the cost of production is bound to advance proportionately with the increased cost of material and labor, and there are signs ahead of coming advances.

New tramp steamers of about 7,500 tons deadweight, with ordinary specifications, can be built presently at £5 per ton; in fact, a few contracts for steamers of this size have been made at less, and other vessels of smaller tonnage at proportionately increased cost. Some new steamers of 6,500 tons have been sold at £5 per ton deadweight, but now they have been disposed of there are not many new vessels left on the market.

Second-hand cargo steamers can still be bought very cheaply, but they are difficult to sell, owing to the demand at present being so small, whereas the value of handy passenger and cargo steamers is appreciating, and many have recently been sold at good prices.

The amount of obsolete tonnage unsold is still very large, and as most of the shipbreakers are well bought, the value of such steamers has fallen. We have said for years past that there are hundreds of thousands of tons of antiquated vessels that must be demolished—there is no other course open—and the sooner the inevitable is faced the better for all concerned. Our government is adopting this course with regard to its old war vessels.

The leading feature of the last six months has been the growing disposition for the amalgamation of shipping interests, and the formation of large trusts. We have recently seen the Lund line absorbed by the P. & O., the Pacific Steam Navigation Co. has also been acquired by the Royal Mail Co., and a well-known Australian line, it is said, will soon be bought up by one of its colleagues. The important interests of Elder, Dempster & Co. have also been consolidated under one management.

Coaling Station at Tiburon

THE navy department has completed the coaling station for vessels at Tiburon on San Francisco bay opposite the Golden Gate, and approximately eight miles from San Francisco. This station is by no means elaborate, but has a maximum loading capacity of 500 tons per hour. It consists of a deep water wharf running parallel and about 150 ft. from the shore, with a storage bunker on shore of about 10,000 tons capacity. On both sides of this bunker are concrete floors serving as storage areas and having capacity about equal to that of the bunker.

The minimum depth of water at the pier is 30 ft., enabling the largest vessels to coal. Obviously the pier itself forms a harbor in which small vessels may be sheltered, though the usual practice is for the large ships to load on the exposed side. Provision has been made for two independent methods of coaling. Coal may be transferred directly from barges on one side of the pier to a ship on the other by means of two traveling towers, each of which is equipped with a grab bucket. The second method is to bring the coal by means of a cable railway from the storage bunker on shore which is connected with the coaling pier by a trestle. The coal intended for storage is taken from the colliers by the grab bucket of the traveling tower on the deep water pier and deposited into small cars which are hauled over a connecting trestle to the top of the storage bunker and there automatically dumped. When these storage bunkers fill up, new shipments are discharged from the cars through chutes to the emergency storage on both sides of the bunker.

A similar cable system is used for carrying coal from the storage to the ships. Two tracks are laid underneath the bunkers and the cars are loaded by gravity. They are then hauled out and up an incline on a trestle where they proceed to the coaling pier and discharge their loads into continuous lines of shallow hoppers on both sides of the pier. The operation of this system does not interfere with the transfer of coal directly across the pier from barges to ships with either one or both towers. Coal brought from storage by the cars and deposited into the shallow hoppers is chuted by gravity to vessels.

Each tower can transfer coal across the pier at the rate of 200 tons per hour, while at the same time the car system can be in operation and deliver 300 tons in the same period.

The coal deposited in the emergency storage on both sides of the bunker is reclaimed by the grab bucket on the traveling tower on the bunker and can be deposited by this bucket either into the bunker or into delivery cars on top.

The coaling pier is a double-decked structure 390 ft. long having a floored lower deck about 12 ft. above mean low water and an upper deck 38 ft. higher. The lower deck is 48 ft. wide and can be used for the storage of coal or miscellaneous material while the upper deck is 36 ft. wide between tower rails and 55 ft. wide over the coal hopper.

The pier is carried on cast iron cylinders 4 ft. in diameter filled with concrete and resting on hard bottom at depths of 30 to 70 ft. below mean water. The shore end of the trestle, beginning about 100 ft. from the pier connecting the coaling pier with the shore plant, is of timber construction and carries four tracks. The two inside or main tracks lead to the tracks on the coaling pier and to those on top of the bunker, forming a loop of the cable system. The outside tracks are connected to the main tracks at the point of beginning on a gravity switch. These tracks run shoreward beyond the bunker and then turn parallel to it, dropping down an incline until they reach grade level at a point near the end of the bunker.

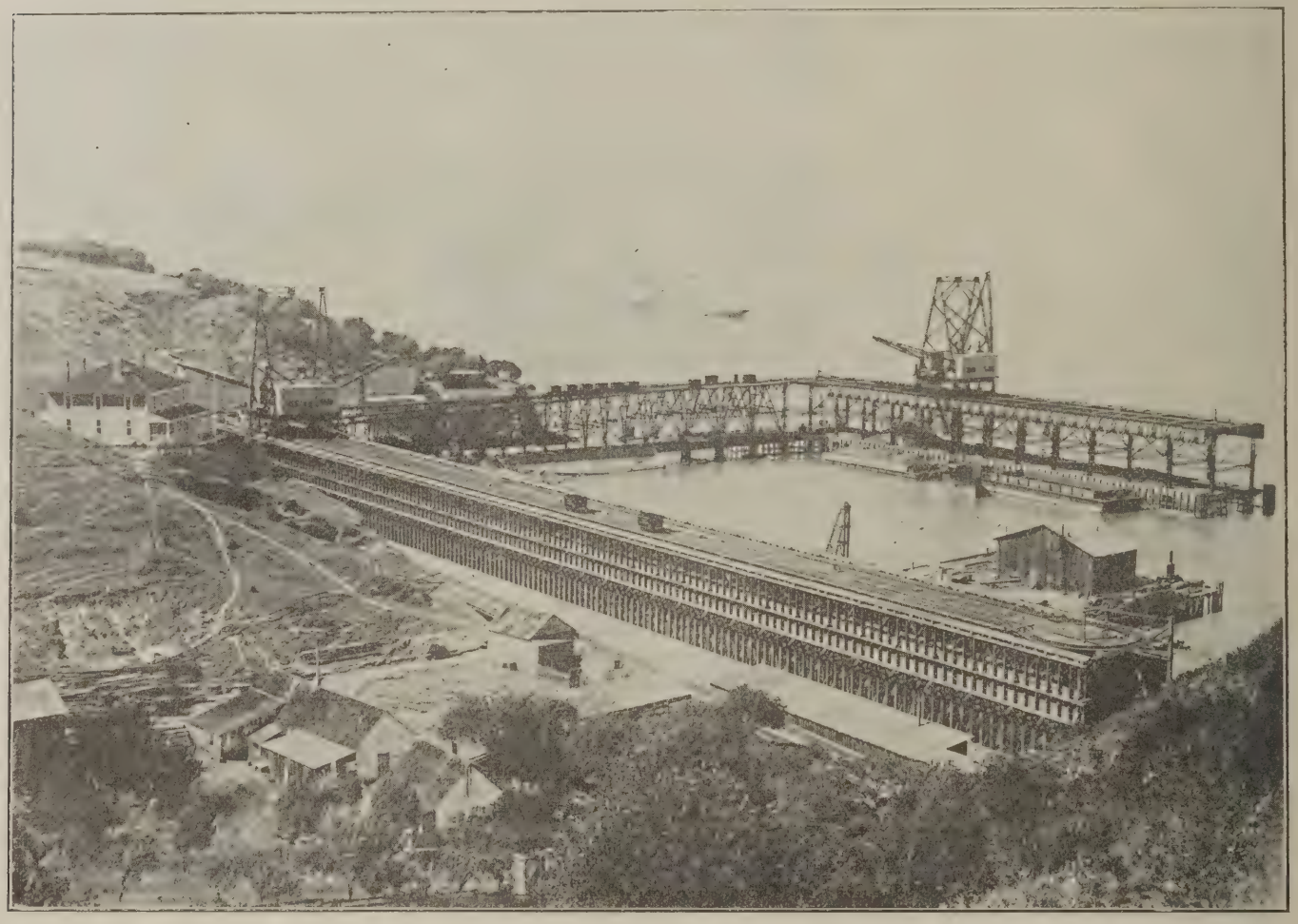
Since the cars are operated by cable system they all have loops at their ends. The coal bunker is 37 ft. wide, 650 ft. long and is located about 400 ft. from the coaling pier. The construction of the steel towers on the coaling pier and on the bunker is the same. Each is a wedge-shaped steel tower about 80 ft. in height with a 30 x 36 ft. base mounted on 16 wheels on 36-ft. gage tracks. The A frame bottoms project on both sides for a distance of 70 ft. and each tower is equipped with a steam operated two-ton grab bucket. Since the tower on the coaling pier must be able to clear the rigging of the ships in order that the vessels may be unloaded or coaled without being moved from their first

mooring, the booms can be folded back and the entire tower shifted at will.

The machinery in each tower is identical and consists of a main hoisting engine of the double-drum, two-cylinder type and reversing turbine engine and a double-drum engine for raising and lowering the booms and traversing the tower. Each tower carries two 60-H. P. boilers and a 1,000-gallon water tank.

The cable for operating the cars carrying coal from the pier to the bunkers and the one for operating the cars from the bunker to the ships are independent of each other. They are, however, interchangeable and are arranged so that cars can be transferred from one track to the other. Each car is equipped with a cable grip to permit of its being attached or detached at any point. The cars are dumped automatically where desired.

The general contract was held by the San Francisco Bridge Co. The cable system, however, was supplied by the C. W. Hunt Co., of New York, while the foundation work was done by the Snare & Triest Co., of New York.



COALING STATION AT TIBURON.

Bureau of Mines

The act establishing a Bureau of Mines in the Department of the Interior, approved May 16, 1910, became effective July 1. As originally approved, the law contemplated the transfer of the entire Technologic Branch of the United States Geological Survey, the mine accident investigations, fuel investigations, structural material investigations, the entire personnel, property and equipment, to the Bureau of Mines, but the Sundry Civil appropriation act approved June 25, amended the law to such an extent that the structural materials investigations, including the personnel and equipment for these investigations, went to the Bureau of Standards, Department of Commerce and Labor.

Carrying out the spirit and intent of the law so amended, the Secretary of the Interior has transferred to the Bureau of Mines the investigation of mine accidents and fuels, together with the personnel and equipment of these investigations and has transferred to the Bureau of Standards the structural materials investigations and the employes of the Technologic Branch of the Survey engaged in these investigations. The fully equipped testing station at Pittsburg also goes to the Bureau of Mines.

The Bureau of Mines, therefore, includes the mine accidents and fuel investigations for which an appropriation of $410,000 was made by Congress. The total appropriations for the Bureau, including salaries, rent and expenses of removal, amount to $502,200.

The work of the Bureau of Mines for the first year will be a continuation and expansion of the work carried on by the Technological Branch of the Geological Survey. The law in itself provides for a variety of other problems that properly belong to the Bureau of Mines and which should eventually be undertaken, such as methods of mining and metallurgical processes, but these activities will be deferred for the most part until Congress gives additional authorization in the shape of adequate appropriations. The spirit of the debates in Congress both on the Bureau of Mines legislation and on the appropriation items emphasized the desire to regard the mine accidents investigations as urgent and this will be the feature of the work.

In all, $310,000 was appropriated for mine accident investigations. Of this

sum, under the general plans approved by the secretary of the interior, $120,000 is to be spent on the rescue stations, $36,000 for housing nine stations; $34,000 for equipping eight new stations; and $10,000 for additional equipment for five existing stations. The allotment for the investigation of explosives is $40,000; for electricity in mining, $14,000; appliances for preventing mine accidents, $8,000; examination and codification of mining laws, $5,000; and other technologic investigations, ore treatment, etc., $10,000. For the analyzing and testing of the coals, lignites, ores and other mineral fuel substances belonging to or for the use of the United States, $100,000 was appropriated. Of this amount, $35,000 will be spent in the chemical and physical investigation of fuels; $25,000 in the inspection of government fuel purchase; $22,000 in fuel efficiency investigations; $5,000 in lignite and peat investigations; and $4,000 in briquetting investigations.

Mine Accident Investigations.

The mine accident investigations, which have been transferred from the Geological Survey to the Bureau of Mines were first authorized in the legislative appropriation act of May 22, 1908, carrying for this purpose an appropriation of $150,000. This was followed by a similar appropriation carried in the act for the sundry civil expenses of the government for 1910. A mine experiment station was established in Pittsburg during 1908, at which, since that time, investigations of explosives, coal gas, dust, electricity and other possible causes of mine explosions have been continually under way. The mining engineering field force of the Geological Survey has already made decided progress in the study of underground mining conditions and methods. Practically all of the coal mines in which mine explosions have occurred during the last two years have been carefully examined, the gases, coke and dust have been analyzed at the laboratory at Pittsburg and every effort has been made to determine the explosibility of various mixtures of gas and air in the presence of shots of different types of explosives. Considerable progress has also been made in the investigation of explosives used in coal mining, and the conditions under which they may be used with least risk. Manufacturers have submitted many explosives for test at the station and a considerable portion of them passed and have been classified among the permissible explosives. The investigations and educational work in connection with the use of artificial breathing and other types of mine rescue equipment, the so-called oxygen helmets, have not only been useful in developing a more satisfactory use of such equipment in the examination of mine explosions, but also better methods for using this equipment in mine rescue work.

Full Investigations.

The fuel investigations under the Geological Survey and which are transferred to the Bureau of Mines have already resulted in a better realization throughout the country as to the value of fuels. One result of this work is that nearly all of the fuel now purchased by the federal government is bought on specifications and subject to test by the fuel division, or purchased after examination made of the coal supplied by the mines from which coal is delivered to the government.

The publications of the Survey relating to mine and fuel investigations, those prepared by the Technologic Branch, will in the future be distributed by the Bureau of Mines. The publications relating to structural materials will continue to be distributed by the Geological Survey. The last of the bulletins of the Technologic Branch to be published by the Survey will be issued from the Government Printing Office about Aug. 1. This bulletin relates to the Explosibility of Coal Dust, and was prepared by G. S. Rice, with chapters by J. C. Frazer, Axel Larsen, Frank Haas and Carl Scholz.

The first of the Bureau of Mines bulletins, the Volatile Matter of Coal, by H. C. Porter and F. K. Ovitz, will be published in the next few months. Then will follow: Coal Analyses, by N. W. Lord and J. S. Burrows; Final Data Regarding Steam Tests, by L. P. Breckenridge; North Dakota Lignite as a Boiler Fuel, by D. T. Randall and Henry Kreisinger; Producer-gas Tests in 1905-1907, by R. H. Fernald; The Coke Industry as Related to the Foundry, by Richard Moldenke; Coals for Illuminating Gas, by A. H. White and Perry Barker; and Petroleum for Combustion under Steam Boilers, by I. C. Allen.

These publications, when issued, can be obtained by addressing the Director of the Bureau of Mines, Washington, D. C.

United Fruit Co.'s Acquisition

The United Fruit Co. is now in complete control of Elders & Fyffes, which is engaged extensively in importing bananas and other tropical products into Great Britain and distributing them there and throughout Europe. In connection with its application to list new stock, the United Fruit Co. submitted a statement to the Stock Exchange which contained the following: "The new shares are to be issued in payment for 225,000 shares which the company has agreed to purchase in the capital stock of Elders & Fyffes, Ltd. The authorized capital stock of the United Fruit Co. is $25,000,000. The amount at present outstanding is $23,474,000, and this will be increased by the additional issue of $1,125,000 about to be made to $24,599,000. The new stock is to be issued as of Oct. 1, 1910, and will be entitled to participate in all dividends which may be declared payable on stock of record on or after that date. Elders & Fyffes, Ltd., is organized under the Companies' Acts of Great Britain, and is engaged extensively in importing bananas and other tropical products into Great Britain and distributing them there and throughout Europe. It owns, as a part of its equipment, tropical plantations, a fleet of ten ocean-going steamships, especially built and constructed for its service, and will shortly add two other steamships now under construction. Its share capital is £450,000, in shares of £1 each. Of these 300,000 shares are fully paid, and on the balance of 150,000 there has been called and paid on each share five shillings, or 25 per cent. Heretofore 50 per cent of the share capital of Elders & Fyffes, Ltd., has been owned by the United Fruit Co. The latter's interest will be increased by the present purchase to 100 per cent. The United Fruit Co. reports the following operations for the nine months ended June 30, 1910: Net earnings, $4,584,087; interest and miscellaneous, $293,485; total net income, $4,877,573; dividends declared, $1,407,992; surplus for nine months $3,469,581; surplus income at close of previous year, $12,006,804; total surplus, $15,476,385; less extra dividend paid November 15, 1909, $2,134,000; balance surplus, $13,342,385.

Messrs. Armstrong, Whitworth & Co., ship builders, Newcastle-on-Tyne, have secured about 70 acres of land on the Tyne side for the extension of their shipbuilding yard, which adjoins the land just purchased. The firm purpose spending over $2,500,000 on these new works, and the site, which has a river frontage of about half a mile, will provide fully for the building and launching of the biggest battleships that are likely to be required for many years to come. This enterprise further will place the Elswick firm in a superior position to any of the shipyards in England for carrying out the requirements of the British or any foreign government for building battleships.

ACCIDENTS TO LAKE VESSELS

VESSEL accidents were numerous during September, giving the ship yards abundant repair work. There were three total losses, the car ferry Pere Marquette No. 18 which foundered on Sept. 9 on Lake Michigan, the steamer New York, which foundered on Lake Huron on Oct. 2, and the steamer Frank L. Vance, which burned to the water's edge at Milwaukee on Oct. 4.

The steamer Pontiac of the Cleveland-Cliffs Iron Co.'s fleet struck at Watson's Reef, St. Marys river, and was so badly damaged that she had to be beached. She was released on Sept. 13 but was leaking so badly that it was necessary to again beach her to prevent her from sinking. She finally succeeded in delivering her cargo of coal at the Sault, where temporary repairs were made. She was later docked at Cleveland.

The steamer Clifford F. Moll was caught very suddenly in a fog while entering Niagara river and naturally got out of the channel. She swung broadside to the current and it was necessary to lighter 3,000 tons of ore before she could be released. She was taken to Ecorse for repairs.

The steamer Lakeland was struck by the barge John Smeaton in Little Rapids Cut near the Sault, cutting a hole in her from below the water line to the deck. After being temporarily repaired the Lakeland was docked at Cleveland. The cause of the accident was the parting of the wheel-chains of the Smeaton. The Smeaton's steering gear again became disabled in Lake St. Clair and she had the misfortune to shear into the steamer Corunna, knocking a hole about 10 ft. long in her port side forward.

The steamers Harvey H. Brown and D. R. Hanna were in collision in the St. Clair river near Sarnia. The Brown was very badly damaged, it being necessary to put a canvas patch 125 ft. long and 40 in. wide on her starboard side to take her to Cleveland: It will take about two months to repair her.

A curious accident happened to the Maritana of the Pittsburg Steamship Co.'s fleet. In attempting to pick up the barge Maia off Lorain on Oct. 1 she got the Maia's anchor chain caught in her wheel, which wound around the shaft, disabling the Maritana instantly. Dynamite was used to break the anchor chain after which the Maritana was put in dry dock.

The steamer W. S. Mack ran ashore on Poverty Island and was released after 1,100 tons of her cargo of ore had been jettisoned.

Altogether the month was quite prolific in accidents. Following is the summary:

DATE.	NAME OF VESSEL.	NATURE OF ACCIDENT.	LOCATION.
Sept.	Str. W. A. Rogers.....	Collided with the Gogebic; both boats slightly damaged.....	Buffalo Harbor.
Sept.	Str. Northern Light	Backed into a dock and broke her quadrant; docked at Superior for repairs	Duluth, Minn.
Sept. 7	Str. Wm. J. Olcott.....	Ran into a dock damaging it considerably; steering gear disabled; docked at Ecorse Sept. 15; repairs completed Sept. 20.....	Above Grosse Pt., Detroit River.
Sept. 9	Schr. Challenge	Caught in fish nets and began leaking; vessel was beached and is thought to be total loss.....	Lake Michigan, near Sheboygan.
Sept. 9	C'rf'y. Pere Marquette No. 18	Foundered in storm; cause unknown, but thought to have been after compartment filling with water through broken or open deadlight, followed by bursting of bulkhead; 28 lives lost.....	Off Sheboygan, Lake Michigan.
Sept. 12	Str. Pontiac	Struck, damaging bottom on port side badly; captain beached her in 20 ft. of water; released on 13th, but leaked so badly that she was again beached; delivered cargo at Soo and was temporarily repaired; left Sept. 20 for Cleveland, where she was docked....	Watson Reef, Soo River.
Sept. 12	Str. Milwaukee	Hit pier while leaving port, damaging her bow; went back for repairs	Chicago Harbor.
Sept. 13	Str. Chas. Rietz.....	Damaged while out in storm on lake, sprang leak after entering river and sank	Cuyahoga River, Cleveland, O.
Sept. 14	Schr. J. B. Newland.....	Struck a reef; crew of four rescued and taken ashore.....	Off N. Manitou Island, Lake Mich.
Sept. 15	Str. City of Holland.....	Slightly damaged by fire while tied up near Main Ave. bridge.....	Cleveland.
Sept. 16	Str. Kingston	Broke her shaft at inner bearings; will be out of commission for balance of season.....	Near Kingston, Lake Ontario.
Sept. 16	Mud Scow	Upset by wave of passing steamer; one man drowned.....	Buffalo River.
Sept. 16	Str. Burlington	Struck; docked at Buffalo; No. 1 tank punctured.....	Ogdensburg.
Sept. 17	Str. Clifford F. Moll.....	Stranded on rock bottom in fog; leaked badly; lightered 3,000 tons of ore; released on 24th; docked at Ecorse.....	Niagara River.
Sept. 17	Str. Perry G. Walker.....	Struck; docked at Lorain, Sept. 20.....	Bar Point, Detroit River.
Sept. 18	Str. Wm. M. Mills.....	Tore bridge-tender's house off Muskego Ave. bridge; completely demolished the building.....	Milwaukee.
Sept. 19	Tug Margaret D.....	Struck by Str. Empire City; upper works crushed and badly damaged	Ashtabula Harbor.
Sept. 20	Str. Lakeland	Hit by barge John Smeaton on port bow, cutting hole from 3 to 6 ft. wide from below water line to upper deck; temporarily repaired at Sault; docked at Cleveland, four plates taken off; repairs completed Oct. 5.....	Little Rapids Cut, near Sault.
Sept. 20	Bge. —ohn Smeaton.....	Wheel chains parted and she collided with Str. Lakeland; her stem was pushed in about a foot, towing chock cleaned off and port side hawse pipe broken; temporarily repaired at Sault.....	Little Rapids Cut, near Sault.
Sept. 20	Str. M. A. Bradley.....	Grounded in thick weather; released on 21st, after lightering 700 tons of coal; docked at South Chicago on 28th; sixteen plates damaged	Detroit River.
Sept. 22	Str. Western States.....	Connecting rod of high pressure cylinder broke pushing cylinder head out; temporarily repaired by her engineer.....	Off Long Point, Lake Erie.
Sept. 22	Str. Louisiana	Ran aground; steering gear broke; lightered part of cargo and was released on 24th.....	Below St. Clair Flats Canal Cut.
Sept. 22	Str. Panay	Collided with Str. Boston; both boats slightly damaged, but neither one stopped	Detroit River.
Sept. 23	Bge. John Smeaton.....	Steering gear disabled, causing her to sheer into Str. Corunna, just passing; second accident on down trip; stopped at Ecorse shipyard and then went to Lorain to be docked; 11 plates damaged..	Lake St. Clair.
Sept. 23	Str. Corunna	Struck by barge John Smeaton; hole 10 ft. long cut into forward port side; leaked badly; stopped at Ecorse for repairs.....	Lake St. Clair.
Sept. 24	Str. Bethlehem	Ran ashore; badly broken amidship, spar deck in line with No. 3 hatch having parted about 4 in., break extending to main deck on both port and starboard side; also two other breaks; released Oct. 4; temporarily repaired at S. Manitou Island.....	South Manitou Island, Lake Mich.
Sept. 24	Str. Wilkesbarre	Damaged while in port; docked at Toledo for new wheel.....	Buffalo Harbor.
Sept. 24	Str. D. R. Hanna.....	Collided with Str. Harvey H. Brown, and struck on Middle ground; released on 25th, after lightering 300 tons; towed to Reid's dry-dock, Sarnia, for temporary repairs; will be docked at Superior..	St. Clair River, near Sarnia.
Sept. 24	Str. Harvey H. Brown.....	Collided with D. R. Hanna and struck bottom; released and taken to Cleveland to be docked; when she arrived at Cleveland had canvas patch 125 ft. long and 42 in. wide on starboard side; spar deck torn away from side of ship and in a number of places	

		was pushed up several ft.; will take about two months to repair her; 100 ft. of starboard side and 50 ft. of deck taken off in drydock	
Sept. 24	Tug Rooth	Stripped all buckets off her wheel on sunken obstruction	St. Clair River, near Sarnia.
Sept. 25	Str. United Lumberman	Severely damaged by fire; cabin burned off and several people burned, but no lives lost; loss, $5,000	Near Port Huron, St. Clair River.
	Str. Leonard P. Miller	Steering gear disabled in heavy sea; anchored at Cove Island and then went to Detour	N. Tonawanda, N. Y. Lake Huron.
Sept. 27	Str. Sierra	Couple of buckets thrown off her wheel	Ashtabula Harbor.
	Str. W. S. Mack	Ran ashore; three tanks punctured; released Oct. 4, after jettisoning 1,100 tons of ore; went to Escanaba for temporary repairs	Poverty Island, Green Bay.
Oct. 1	Str. Maritana	In endeavoring to pick up barge Maia caught Maia's anchor chain in her wheel shaft and was seriously damaged; dynamite used to break anchor chain; docked at Lorain	Lake Erie, off Lorain.
Oct. 2	Str. Bge. L. L. Barth	Sprang a leak in heavy sea on Lake Michigan; sank in 20 ft. of water near dock, for which she headed at full speed when leak was discovered; crew taken off by life-savers	Muskegon, Mich.
Oct. 2	Str. New York	Foundered in storm; crew rescued from yawl boats by Str. Mataafa, passing; heavy seas caused leak which put out fires; pumps were of no use. Total loss	Lake Huron.
Oct. 3	Str. Phenix	Ran ashore	Poplar Pt., Lake Ontario.
	Str. Honduras	Struck; docked at Superior	Buffalo.
Oct. 3	Str. Gogebic	Dragged her anchors and went on beach under breakwater	Detroit River.
Oct. 4	Str. Frank L. Vance	Burned to water's edge; crew rescued	Off Ludington, Lake Michigan.

CASTING LARGE PROPELLERS IN MONEL METAL

BECAUSE of its resistance to corrosion, its strength and the readiness with which it may be machined, Monel metal, a comparatively new alloy of nickel and copper has made its appearance as a growing factor in foundry practice for certain classes of castings. Illustrating the broadening use of this metal, a new and modern foundry especially designed and applied to such casting practice has recently been erected and put in operation by the Bayonne Casting Co., Bayonne, N. J. This plant is the only one of its kind devoted exclusively to the melting of this alloy and its capacity for such work is on a large scale.

There is now being carried on at this plant some interesting work, among which is the casting of large propeller wheels for battleships of both the United States and foreign countries. Recently there was taken by this company a contract for the manufacture in Monel metal, of the twelve propeller wheels for two large battleships now building for the Argentine Republic in the yards of the Fore River Ship Building Co., Quincy, Mass., and the New York Ship Building Co., Camden, N. J. These will be in one piece, about 15 feet 6 inches in diameter, and will weigh 16,000 pounds each, and together constitute the largest contract for Monel metal castings ever placed. The company also has on hand the casting of four propeller wheels for the United States battleship Florida, which was recently launched in the

FIG. 1—MOLD FOR A 16,000-POUND MONEL METAL PROPELLER, IN A STEEL-LINED PIT

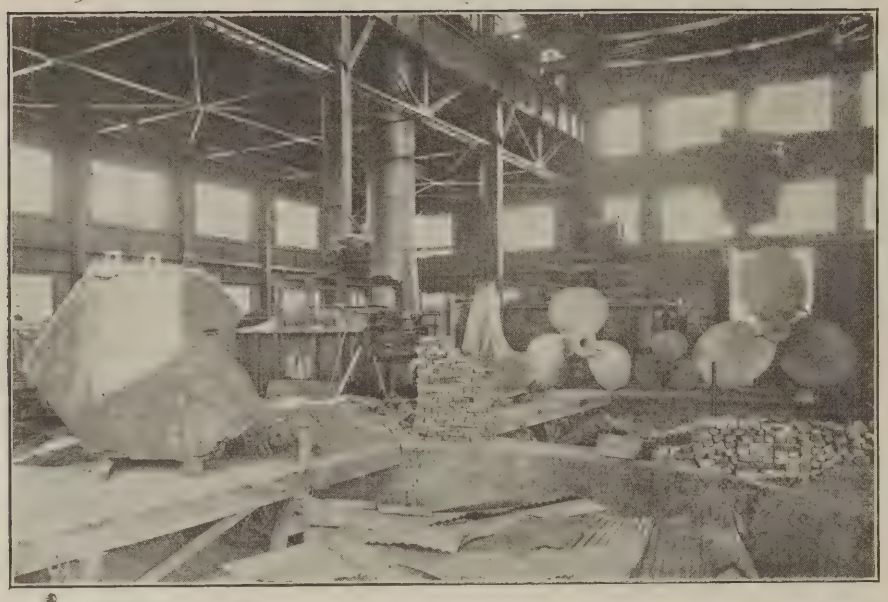


FIG. 2—VIEW OF ONE END OF THE MONEL METAL FOUNDRY OF THE BAYONNE CASTING CO. THE FURNACES ARE SHOWN AT THE LEFT AND A MOLD IS BEING DRIED IN THE PIT IN THE FOREGROUND

Brooklyn navy yard. These will be in one piece, 10 feet 6 inches in diameter, and will weigh about 8,000 pounds each.

Casting Practice.

The practice of casting Monel metal is very similar to that followed in steel foundries. The melting equipment of the plant consists of standard reverberatory furnaces which are oil-fired, the fuel being fed by gravity. There is no forced draft, the melting being done by natural draft. The metal is charged into the furnace in the form of pigs or slabs, which are each about 15 x 8 x 3 inches in dimensions and weigh about 85 pounds each. The melting point is high, being about 2,500 degrees Fahr. and eight hours are required to the heat. No fluxes or alloys are necessary. Because of the relatively scant knowledge of nickel and its peculiarities, the use of Monel metal in the foundry requires expert attention in melting. The melting capacity of the Bayonne Steel Casting Co. is about 40,000 pounds daily, consisting of one furnace capable of producing 30,000 pounds, one of 7,500 pounds and one of 2,500 pounds. Several Rockwell furnaces of 200 pounds capacity each for brass work are also included in the shop equipment.

Casting Propellers.

The casting of the large propeller wheels is interesting. The pits used are 25 feet in diameter and 5 feet deep, and are in the form of submerged steel tanks, built of rolled plates. This type of construction was adopted because of the shifting nature of the ground upon which the shop is located due to its proximity to tide-water, and in preference to cement because of the lower cost. An ordinary loam mold for the casting is built up on the pit bottom or base plate. Millville gravel from nearby New Jersey deposits is used, and this is the same grade of sand which has been adopted by the steel foundries of that locality. An especially good sand and facing are required because of the heat of the molten metal, which exceeds that of steel when poured. The ramming is done by air rammers of the floor type. After the mold is in position and dried and the pattern drawn, the copes are bolted on to the base plate. A runner box with four apertures which feed directly into the mold is placed upon the copes and the head box inserted. The feeding is done quickly from a 30,000 pound ladle into which the furnaces are tapped. Rapid pouring is necessary for the elimination of dross that otherwise might collect. The

FIG. 3—COMPARATIVE SIZES OF PROPELLERS CAST IN MONEL METAL

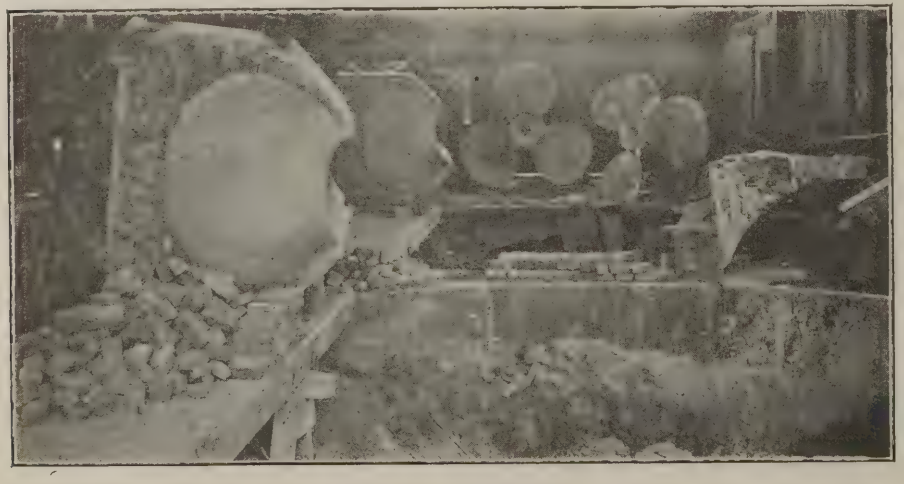


FIG. 4—COPES FOR A PROPELLER MOLD ARE SHOWN AT THE LEFT; WHEELS FOR THE U. S. S. FLORIDA ARE IN THE BACKGROUND

FIG. 5—THREE 8,000-POUND PROPELLERS, CAST IN MONEL METAL, FOR THE U. S. S. FLORIDA

molten metal pours quite similar to brass. The casting is allowed to set for four days in the mold before it is shaken out. One 20-ton Morgan electric traveling crane with a 5-ton auxiliary of the same type command the operations, and there are also two 7½-ton jib cranes which serve for the handling of the material in about one-third of the entire shop.

Assays and tests of each heat poured are taken. The following results on physical tests were shown by pieces recently cast in sand from heats of the Bayonne Casting Co.: Tensile strength, 72,283-81,609 pounds per square inch; elastic limit, 35,920-40,731 pounds per square inch; elongation in 2 inches, 38-28½ per cent.

Suitability for Marine Service.

Its strength and non-corrosive properties make Monel metal castings especially suitable for marine service in such parts as propellers, pump fittings, valves and valve fittings which are exposed to water. Molding machines are used in the manufacture of the smaller parts. The first propeller blades of Monel metal were adopted by the United States government about 18 months ago for the battleship North Dakota. Recently, in dry dock, an inspection of these blades was made, which showed that they had suffered little effect of their long service. A number of torpedo boat destroyers now in service are also equipped with propellers manufactured of Monel metal. Another use to which the metal has been recently put is in the manufacture of pickling frames for tin plate works. The acid bath into which these frames are plunged for cleansing the rolled plates has little effect upon the casting.

Composition of the Metal.

Monel metal is composed of about 68 per cent nickel, 27 per cent copper and the balance of iron and manganese in about equal proportions. The special properties claimed for it are its extreme non-corrosiveness, its high modulus of elasticity and its strength, which is said to be greater than that of steel. It is slightly magnetic and can be welded, brazed, soldered, forged or drawn. It is now commercially produced in a variety of forms such as ingots, hot or cold rolled rods, sheets, wire and castings. It machines very much as mild steel and at about the same speed. It is produced as raw material by the Orford Copper Co., New York City, a subsidiary of the International Nickel Co. The physical properties of the alloy are given as follows:

Melting point, 1,360 degrees Cent., (2,480 degrees Fahr.); specific gravity (cast), 8.87; weight per cubic inch, 0.319 pounds; electrical conductivity, 4 per cent (copper 100 per cent); heat conductivity, 1/5 that of copper; modulus of elasticity, 23,000,000; shrinkage, ¼-inch per foot.

Largest French-Built Liner

Although not equal in size to the Cunarders Mauretania and Lusitania, the new turbine liner France, building for the Compagnie Générale Trans-Atlantique, for service between Havre and New York, which was successfully launched in September, at the Penhoüt yard of the Chantiers de l'Atlantique, St. Nazaire, will be the largest merchantman under the French ensign, and, at the same time, the largest boat as yet built in France. Speed and the character of her accommodation are both being attended to with great care, and in other respects she will embody many new features, and will consequently take a place in the front rank among modern liners. She is, indeed, the latest embodiment of the enterprise that animates the French Trans-Atlantique Co.

Built at St. Nazaire by the same firm as was responsible for the La Provence, Chicago, and other first-class boats, her success is assured. She will be engined by her builders, who are licensed to construct Parsons turbines. The vessel's principal measurements are: Length over all, 715 ft. 3 in.; breadth over all, 75 ft. 3 in.; depth from houses to keel, 78 ft. 9 in.; draught, 29 ft. 6 in.; gross tonnage, about 23,000 tons; displacement, 27,000 tons; I. H. P., 45,000; anticipated speed, 23½ knots. She is of the 8-deck type, and will carry some 2,000 passengers.

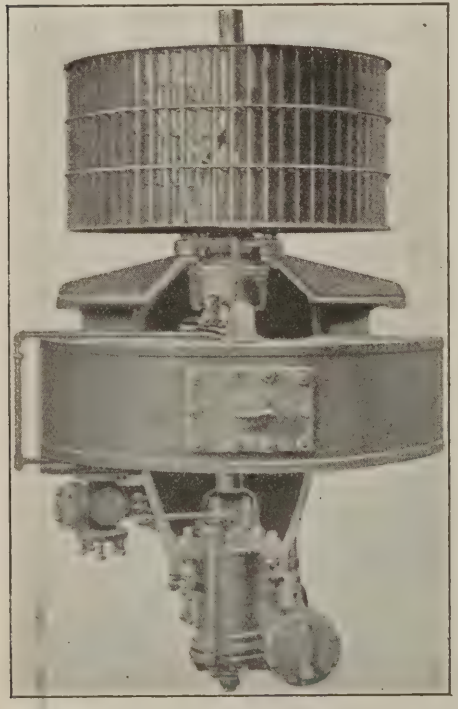
In order to insure stability, she has been fitted with bilge keels for over half her length; thus she will easily resist rolling in a seaway. Twelve watertight bulkheads divide the ship into 13 watertight compartments, which added to the 16 compartments of the double bottom, make the vessel practically unsinkable. She will be propelled by four screws, driven by two sets of Parsons turbines. There will be two H. P. and two M. P. ahead turbines driving the wing propellers, and two L. P. ahead turbines connected with the astern turbines and driving the central shafts. The four-bladed propellers are of manganese bronze. Steam will be supplied to the main engines and auxiliaries by four groups of boilers extending 279 ft. in length, or nearly one-third of the ship's length. These boilers are either single-ended with four furnaces or double-ended with eight furnaces each, and work at 200 lb. pressure. The boilers will be operated with Howden's forced draft system, which gave such good results on board previous liners belonging to the same company. The four funnels rise 112 ft. above the grate bars; their elliptical axes are respectively 17 ft. 6 in. and 13 ft. 5 in. The main and auxiliary condensers, it is interesting to note, are of the "Contraflo" type. The vessel will be fitted with wireless of the latest type, and also submarine signalling apparatus. Twelve sets of Welin quadrant davits are fitted.

Not only size and speed will entitle the France to be called the largest and speediest liner of the French mercantile fleet, but probably her most remarkable features will be the luxuriousness and the refinement of the internal decorations. The main impression aimed at will be one of simplicity, but of calculated intent.

The tow boat Leader of the fleet of the Monongahela River Consolidated Coal & Coke Co., was burned on Sept. 27 on the Ohio river near Economy, Pa.

Oil Fuel on Destroyer Roe

Considerable interest attaches to the recent tests of oil fuel apparatus on the torpedo boat destroyer Roe, built by the Newport News Ship Building & Dry Dock Co., and delivered to the government on July 14. The Roe is the first of the destroyers designed for oil fuel to be delivered and the department officials have in consequence been deeply interested in the working of the system.

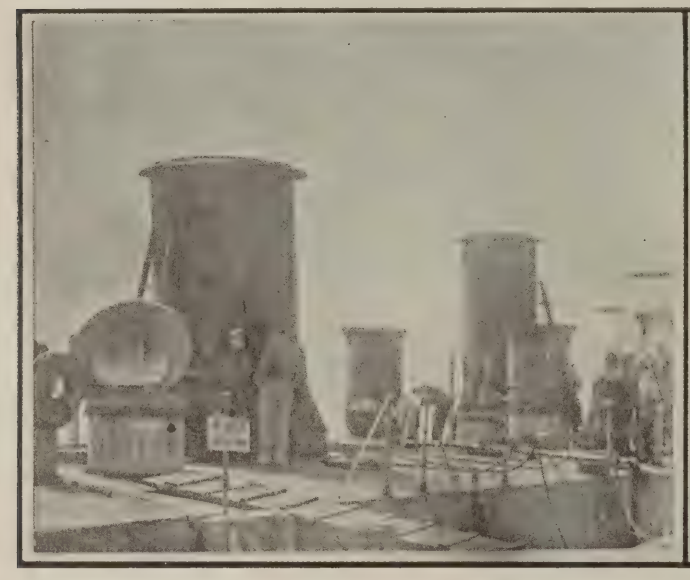


"Sirocco" Forced Draft Fan with Direct-Connected Steam Turbine on New Torpedo Boat Destroyers.

Although the use of fans for forced draft and ventilation is common in all navies and in the merchant marine and for supplying blast to oil burning forges and furnaces in industrial plants, it is believed that the United States navy has, in these destroyers, made the first applicaton of fan blast to the burning of oil in naval vessels. The fans adopted on the Roe are of the "Sirocco" type, of vertical design, and direct driven by Terry steam turbines. The fans have a diameter of 30 inches but are supplying 2,300 cubic feet of air per minute at 5-inch water pressure and at 1,400 revolutions per minute. The entire design involves many intricate problems, which were, as the tests demonstrated, satisfactorily worked out by the American Blower Co., builder of the apparatus.

The boilers of the Roe are of the Thornycroft water tube type, built by the Newport News Co. The accompanying photographs, taken during dock trials, show the almost entire absence of smoke, even under abnormal conditions.

The enlisted man in the navy is said to be very much interested in oil fuel and in the consequent abolition of the dirty job of "coaling ship," an expression which will now have to give way to "oiling ship."



Stacks of United States Torpedo Boat Destroyer Roe, During Test with 3-In. W. G. Air Pressure.

United States Torpedo Boat Destroyer Roe, Showing Smoke with 3.2-In. W. G. Air Pressure with Oil Burners Opened Excessively.

Trade Notes

The Welin Davit and Lane & DeGroot Co., Long Island City, N. Y., just received a letter from their London house, an extract of which follows:

"Some years ago, we fitted the R. M. S. Aragon with two sets of Quadrant Davits, the R. M. S. Araguaya with four sets and subsequently the Amazon and the later boats the Avon and Asturias throughout. The first-named of these vessels has now come in for refit, and the owners have decided, notwithstanding the expense, to dismantle and discard the old type of davit, and to refit the ship throughout with Quadrant davits. We have this morning received the order to execute this work."

The Atlantic Works, Inc., Twenty-eighth street and Gray's Ferry road, Philadelphia, have recently shipped one of their B 17 bevel band saw machines to the Old Dominion Steamship Co., for their plant at Suffolk, Va., and one of them to the Henry Diebert Barge Building Co., for their new yard at Chesapeake City, Md.

The Safety Car Heating & Lighting Co., 2 Rector street, New York, have just issued the first number of "Safety Heating and Lighting News." The purpose of this particular number is to provide detailed information of various equipments of the company for railroad use. The edition is well printed, is copiously illustrated and contains much matter of interest in relation to the lighting and heating of railroad cars.

The Canada Foundry Co. has purchased the plant of the Canadian Ship Building Co., at Bridgeburg, Ont., and will turn it into a structural steel plant.

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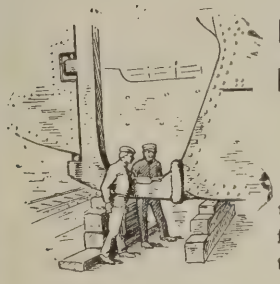

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Mr. Newberry and Navy Yard Management

By Rear-Admiral Caspar F. Goodrich, U. S. N.

(Reprinted from *The Independent.*)

THE subject of the organization and administration of our naval establishments on shore has received much attention of late through the measures of reform introduced by Sec. Newberry, through the steps taken by Sec. Meyer to give effect to his own views on this inportant topic, and through the investigations by the House Naval committee, now accessible to the public in a volume entitled "Hearings on the Proposed Reorganization of the Navy Department Before the Committee on Naval Affairs of the House of Representatives." Much was done by Mr. Newberry, who with one stroke abolished the multiplicity of shops and gathered all operations of like nature under one head and substantially under one roof. For reasons which he has announced in several places and on several occasions, Mr. Meyer has thought best to create two main divisions of navy yard activity, one dealing with the "hulls" of vessels, the other with their "machinery." This action on Mr. Meyer's part has served to make more clear than before the necessity of developing a body of skilled "shop managers." So far as the navy on shore is concerned, this has been and still remains a pressing want.

Familiarity with Shop Management.

Only those who are familiar with mechanical processes and the ways of our largest and most prosperous manufacturing corporations can realize that a man whose knowledge, training and personal force enable him to get out of machinery and employes the maximum of profit is almost beyond price. The writer, on one occasion, when seeking a competent superintendent for a great constructional branch of the Government, applied for help to a certain well-known ceptain of industry. This was the answer received:

"What pay can you give him? If $25,000 a year, I know your man; if $15,000, there are two or three who might serve; if only $5,000, the woods are full of them. I give my superintendent $50,000 and make money. It would be poor economy to hire a $10,000 man and lose money. If Mr. Blank wanted $100,000 a year he could get it for the asking."

How can the navy hold its own against such men as Mr. Blank? Let us see how the case stands before giving up all hope. In the first place Congress cannot, if it would, sanction any such compensation as is required to secure the one man whom the writer's friend had in mind. With difficulty is it induced to grant even so much as $3,000 per annum. Since the skilled talent the navy needs of this nature may not be purchased in the open market, recourse must be had to intelligent officers subject to the department's authority. In them it has, to begin with, loyalty, ambition and marked capacity, a most promising foundation upon which to build its edifice of training. What, speaking generally, does this expression "training" imply?

Methods of Management.

While there are various schools or methods of shop management, all which deserve study or adoption are based upon actual knowledge of what work any machine or any mechanic is capable of turning out in a given time. The day of rough guessing and of the rule of thumb is passed; that of exact scientific direction has dawned. The machine is so geared and driven as to be crowded to the limit of its power under minute specific instructions governing every step of the operation. These instructions are issued from an office wherein are kept the records of countless observations and computations, which result in a perfect understanding of what any given tool may be made to accomplish. Nothing is left to the judgment of the employe. However competent, his wisdom cannot rival, much less exceed, the combined wisdom of many investigators acting for long periods of time on a well-defined plan, and measuring, counting and tabulating the phenomena they witness without prejudice or favor. This instance is but one of many, none of which can be neglected if we seek to secure the best results. The care, speed and tension of belts, the change in methods necessitated by change of the metal to be cut, since wrought iron, cast iron, brass and steel (according to its quality) each demands its own peculiar treatment; the value of the various kinds of tool steel for each class of work; the way to fashion wood with rapidity and without undue waste; the number of rivets which can be well driven in a stated time; the number of square feet of pigment applied to diverse surfaces; the number of tons of coal or sand a well-taught laborer may shovel in a day; the number of cubic yards of soil he can excavate, whether clay, loam or hard pan; the economic handling of weights to avoid retracing their path; the latest improvements and devices in machinery, etc., may be mentioned as part of what a manager must learn to reach the high-water mark in his proficiency. Now these things can only be acquired after long experience by a man who, making them his particular aim, devotes to them time, thought and patient industry. Books, pamphlets and articles in the technical journals must be conned over and their applicability to the work in hand determined; other shops must be visited for the lessons they teach or for the warnings they convey; from intelligent and successful superintendents hints must be extracted as to the best ways of laying out and carrying on the different classes of undertakings. These things combine to form a school whose sessions never cease and from which the student will gain in proportion to his own mastery of the subjects taught. Above all, he must keep in touch with those who make shop management in its broadest sense their individual specialty.

What the expert in this respect can accomplish may be seen in a few only of the many cases that might be cited. In the first place, his methods are grounded on a universal skepticism. He takes nothing for granted; whatever is, may be right or it may be wrong; analysis and demonstration alone will show. Every operation, whether manual or mechanical, he holds to be governed by some law which it is his duty to determine. For example, nothing would be simpler than to pick up pigs of iron from a pile alongside a railroad track, carry them up a gangplank and stack them on a platform car; yet this handling is subject to a physical law so manifest after explanation that we wonder its importance has not before been generally realized. After carrying a number of pigs, in the manner described, the laborer feels fatigue and in consequence he slackens his speed. What has happened? The muscles of his arms, back and legs have been depleted of their vital tissue in spite of the fact that his blood circulation has been greatly stimulated. The waste,

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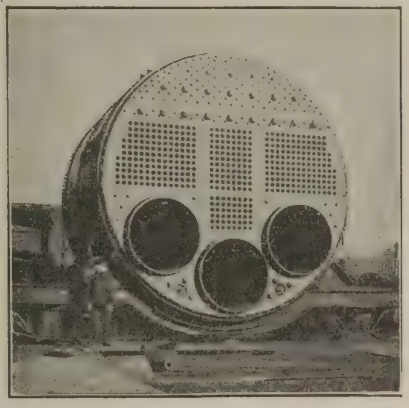

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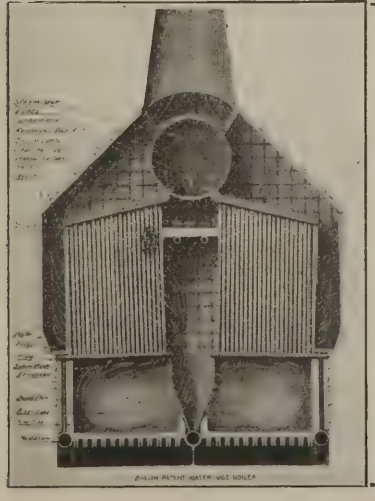

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it appears, is greater than the supply. Let him rest a few moments, the waste will be quickly repaired and the man will be quite fresh and vigorous again. Since he is paid by the ton, he is, naturally, unwilling to stop in his work lest, as he fears, he may suffer in pocket. After some persuasion, one such laborer was induced to move for a whole day under specific orders from an expert who stood by him with stop watch and recording tablet in hand. To the workman's surprise, his tons had multiplied in number and yet at the end of the day he was no more tired than he had been previously when toiling after his own fashion. It seems hardly creditable, although it is true, that with only a good average laborer engaged on this job, the amount of iron thus moved habitually has risen from twelve and a half tons to forty-seven and a half tons in ten hours.

Guess Work Eliminated.

In the case of a machine, guesswork is eliminated. The expert counts the teeth in its gears, measures its parts and ascertains the strains and stresses it can bear. Then he adjusts the width and tension of the driving belt so that the latter furnishes the maximum power which the machine can utilize without risk of damage. When a piece of metal has to be reduced in size through turning or planing, he solves, by a peculiar graphic appliance, an equation which represents mathematically the character of this particular mechanism and the work it is called upon to do. This equation contains sometimes as many as nine variable quantities. The expert gets, as his result, the speed at which the machine should be driven, the depth of cut and the rate of the feed to the cutting tool. Using these figures, the mechanic obtains at once the utmost of which that particular apparatus is capable with safety. In one admirably equipped factory under an excellent manager of the old school, the expert took the latter's best man and best lathe, worked out his little equation and immediately more than doubled the output. Extending his investigations throughout the works, he increased the product of every machine not less than twice and in some instances nine times; all this through the substitution of science for empiricism.

Arousal of Interest.

Under the new order of things, the employes' interest is aroused and his co-operation enlisted by assuring him, first of all, the standard daily wage of his neighborhood, and, secondly, by paying him a liberal bonus for doing any job in less than the time allotted by the detailed written instructions he receives. It is quite customary for a man to get 30 per cent extra in his pay envelope at the end of the week, while not infrequently his bonus runs up to 50 per cent or even 60 per cent. Is it astonishing that the operatives themselves welcome such a system?

Nor can the human element be ignored. A firm yet tactful dealing with his employes is not less essential than a full understanding of machinery. In this respect, men differ as widely as the poles. To some this important faculty comes by intuition; to others, as the consequence of study and experience; to more again, it can never come at all. The metier of the last is by nature distinctly not that of the shop manager. The mere holding of a commission in the navy will, therefore, not suffice, whether it be in the line or in the corps of constructors. Some of the requirements in this connection are absolutely mandatory, viz.: Natural aptitude for the calling; a broad groundwork of technical knowledge; some shop experience, wherein quality rather than quantity counts (for too much time passed in a poorly fitted out and slackly administered shop may easily be worse than none at all); entire devotion to this pursuit, to the exclusion, for the time being, of all other ambitions. It would also appear as if extended assignments to this duty were unavoidable. It is only in meeting these exacting conditions unreservedly that the navy can hope to achieve industrial results comparable with those reached daily in private establishments. As the logical outcome of his deliberations on this question, Secretary Newberry found himself driven to look to the naval constructors to develop into trained, scientific managers (for these officers never go to sea), yet, even among their number, some, he knew, would prove deficient in those traits of character which the true shop manager must possess, and so they would gradually drift into other professional employment where their abilities would be equally valuable to the Government. Through this weeding out of such of the constructors as gave no hope of becoming good managers, a competent and skillful staff would, he expected, remain to push on the navy's work on shore and introduce those economies which all recognize as large and yet attainable.

Long and Toilsome Road.

From what has been said it may be seen that a good organization having been established in our navy yards, much still remains to be done to develop, under the system finally adopted as on the whole best suited to the Government's needs, a set of men able to make that organization thoroughly efficient. That this will be the eventual outcome cannot be doubted by those aware of the earnestness and energy with which other correlated problems have been attacked. But the road is long and toilsome, calling for courage, perseverance and faithful labor on the part of all entering upon it and justly demanding patience and a suspended judgment from others who, watching these efforts toward better things, hope that they may speedily be crowned with complete success. None the less, a right comprehension of the ultimate end, of the best means to that end and of the difficulties that must be encountered and overcome seems not only prudent but indispensable.

Mr. Newberry's grasp of the situation, his share in bringing about a better state of things and his proposed solution of this knotty problem are too important not to warrant study and recognition.

Liability of Vessel for Injury to Another

An oil-burning steamer, lying beside Long Wharf at Oakland, in San Francisco Bay, discharged a considerable quantity of inflammable fuel oil from her hold into the waters of the bay, which was carried by the wind and tide under the wharf, where, mixing with the floating debris, it formed a mat. The wharf was 90 feet wide, supported on piles, and there were vessels lying on the opposite side. The floor of the wharf was in places soaked with oil which had escaped from oil-burning engines used thereon. By some accidental means the inflammable mat formed on the water was set on fire, burning a portion of the wharf, and also injuring libelant's vessel lying on the other side, and around which the oil floated. Held, That the negligent act of the steamer in discharging the oil into the bay was the proximate cause of the injury, which, with knowledge of the inflammable character of the oil, the adjacent wharf on which men and engines were working, the surrounding vessels, and the prevailing wind and tide, should reasonably have been anticipated, as a probable consequence.

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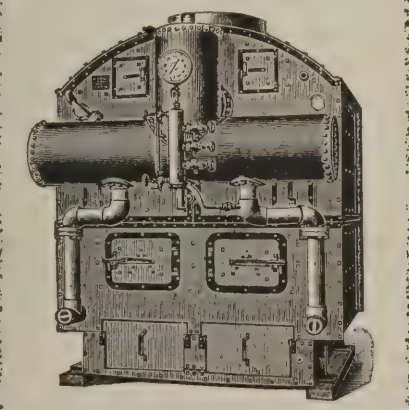

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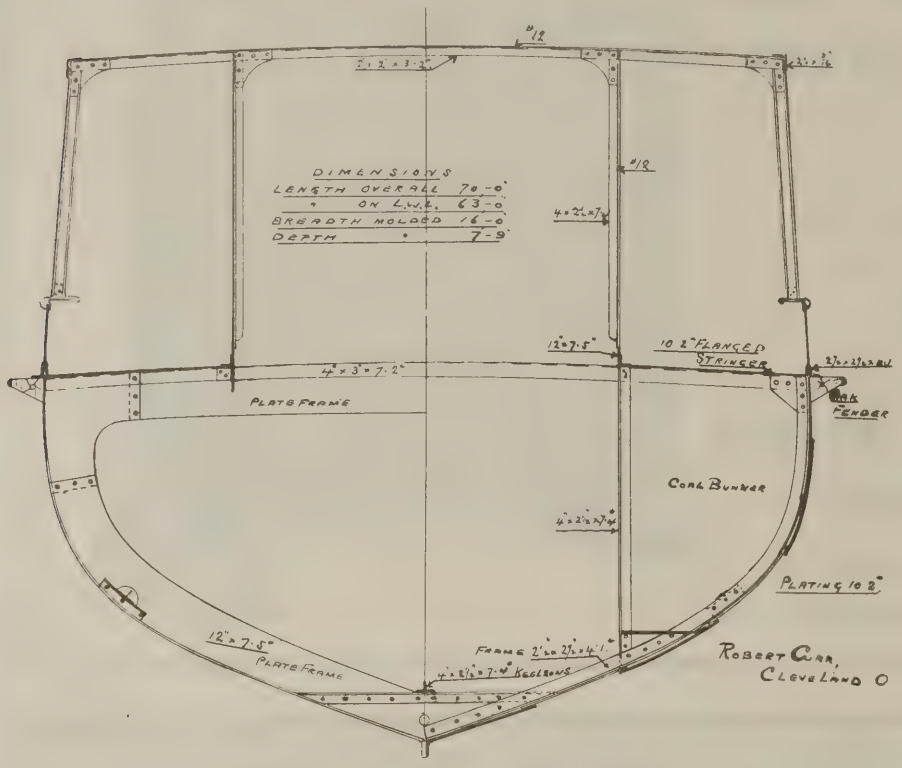
Fishing Steamer for Case Fish Co.

Robert Curr, naval architect, is building a small fishing steamer for the Case Fish Co., at the works of Murphy & Donnelly, Cleveland. The steamer is 70 ft. over all, 63 ft. on the water line, 16-ft. beam and 7 ft. 9 in. deep. The engine is high pressure, 14 x 14 in., supplied with steam from a Scotch boiler, 5 ft. 6 in. diameter and 10 ft. long. The little vessel is up-to-date in every respect, having plate frames spaced 40 in. apart, dispensing with hold stanchions. The bunkers are self-trimming and so arranged to allow ample space to get around for painting and keeping in good order. The forepeak is arranged for carrying ballast and is thoroughly stiffened. The plating is doubled 24 in. above and below the water line, and a 12-in. plate forming a breast hook is fitted to the shell plating on the load water line, making the vessel amply strong in resisting ice floes. The only wood used is an oak fender, which runs all around the vessel. As the steamer was built two squares away from the river, she was carried on rollers to the old river bed and launched on Monday, Oct. 10.



MIDSHIP SECTION OF FISHING STEAMER.

The Northern Dredge & Dock Co., Duluth, were the lowest bidders for dredging in Marquette harbor, their bid being 19 cents per cu. yd.

Larsen's Trip Through Niagara Rapids

Capt. Klaus P. Larsen successfully shot the Whirlpool Rapids in the Niagara river on Sunday, Sept. 18, in an open 18 ft. power boat. It is unfortunate that comparatively few persons saw this notable achievement. About 100,000 persons had gathered along the Gorge Railway and on the bluffs, but Larsen did not start on schedule time and an hour or two later it was announced that his boat had been seized by the authorities. The fact was that Larsen had been maneuvering his boat at the base of the falls and had temporarily deranged the machinery through driftwood catching in the wheel. As soon as this was adjusted, however, he started down stream in the gathering dusk and probably not over 200 persons altogether witnessed his feat. He held to the center of the channel and had his boat under perfect control at all times. In encountering the Giant Wave his boat was thrown somewhat obliquely toward the American shore but he righted her course instantly with the tiller. He successfully avoided the Whirlpool and sped on towards Lewiston, the perfect master of the situation. By this time, however, he had shipped sufficient water to drench the ignition system, which had not been waterproofed, and his engine came to a stop. His boat was then caught in one of the numerous eddies and drifted to the American shore about a mile and a half above Lewiston.

This was the first boat to have made the trip under power since the Maid of the Mist shot the rapids in the 50's. If this trip has accomplished nothing else, it has demonstrated that the terrors of the Niagara Rapids are more imaginary than real. There are no rocks in the channel. The power boat was of the ordinary open sea type, 18 ft. long and 5 ft. 2 in. beam, built by the Cleveland Auto Boat Mfg. Co., of Cleveland, and equipped with a Ferro engine. The cockpit was decked completely over with the exception of a hole about 2½ ft. in diameter in which Larsen stood. Around this opening a tarpaulin was stretched which during the voyage was wound tightly around his waist.

A reinforced concrete barge to be used for carrying dredging spoil has recently been launched at Stolp, Pomerania. Of the four holds, into which it is divided, the inner two are open and receive the spoil, while the outer two are covered and act as air chambers to keep the vessel afloat. The boat has a length of 33 ft., a beam of 13 ft. and a depth of 5 ft. 3 in.; its draught, light, is 20 in.

In consequence of the excellent results of the destroyers fitted with the Zoelly marine turbine, the German naval authorities have ordered from the Germania yard at Keil, Germany, six more boats thus equipped. It is understood that the torpedo boat G 173, built by Messrs. Krupp & Co., and propelled by Zoelly turbines, attained a speed of 33.35 knots at her trial. This is the first German warship to be fitted with Zoelly turbines.

Messrs. Yarrow & Co., of Glasgow, have at present in hand two destroyers for the British government, of a special type. They are building, in Holland, two destroyers, 230 ft. long by 21 ft. 6 in. beam, for the Dutch government. They also have in hand one destroyer for the Portugese government, the hull of which is being built in Lisbon and the machinery and boilers supplied from Messrs. Yarrow's Works at Glasgow. They are also building two fast gunboats, propelled by internal combustion engines, for the governor general of Bagdad.

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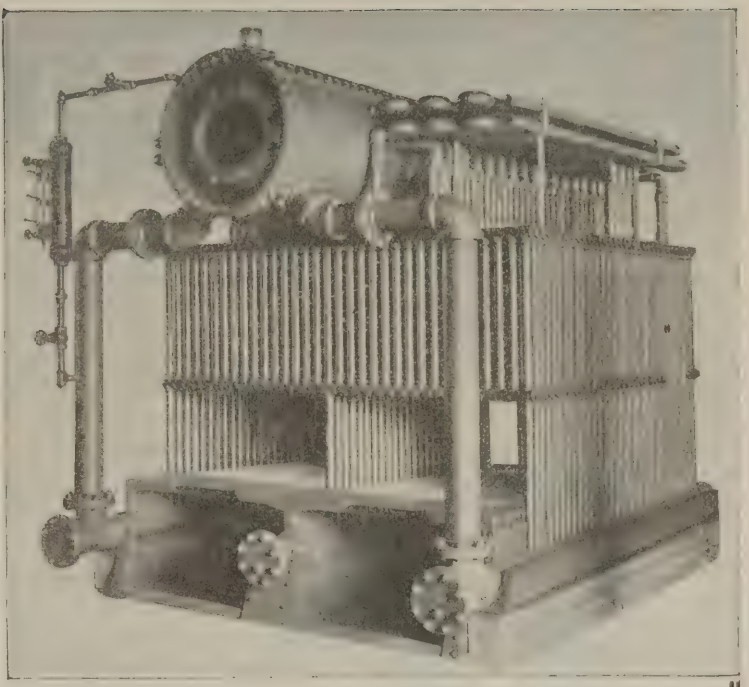

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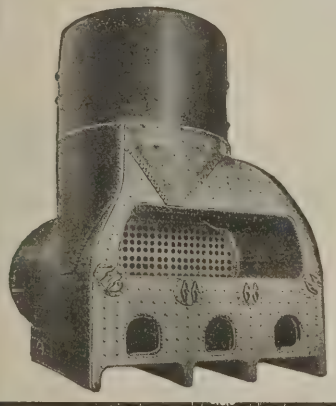

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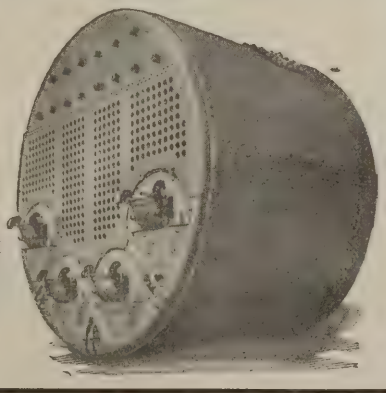

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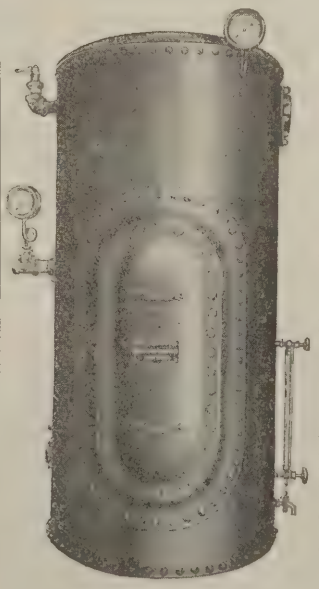

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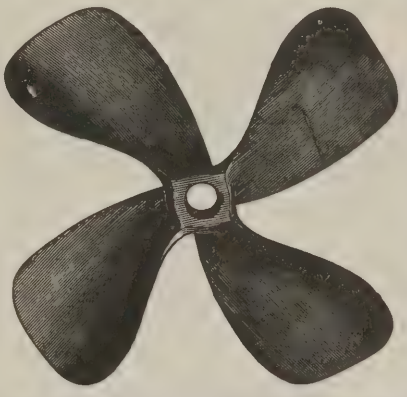

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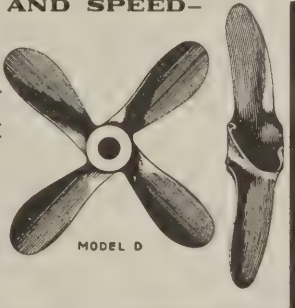

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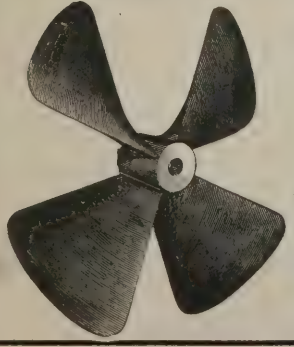

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Williamson Brothers Co., Philadelphia, Pa.

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American Ship Building Co., Cleveland, O.
Bath Iron Works, Bath, Me.
Briggs, Marvin, New York, N. Y.
Chicago Ship Building Co., Chicago, Ill.
Chase Machine Co., Cleveland, O.
Clyde Ship Building & Eng'g. Co., Port Glasgow, Scotland.
Collingwood Ship Building Co., Collingwood, Ont.
Detroit Ship Building Co., Detroit, Mich.
Fletcher, W. & A., Co., Hoboken, N. J.
Fore River Ship Building Co., Quincy, Mass.
Gillett & Eaton, Lake City, Minn.
Great Lakes Engineering Wks., Detroit, Mich.
Johnston Bros., Ferrysburg, Mich.
Kingston Ship Building Co., Ltd., Kingston, Ont.
Manistee Iron Works Co., Manistee, Mich.
Manitowoc Dry Dock Co., Manitowoc, Wis.
Maryland Steel Co., Sparrow's Point, Md.
Milwaukee Dry Dock Co., Milwaukee, Wis.
Moran Co., Seattle, Wash.
Newport News Ship Building Co., Newport News, Va.
New York Ship Building Co., Camden, N. J.
Sheriffs Mfg. Co., Milwaukee, Wis.
Superior Ship Building Co., Superior, Wis.
Toledo Ship Building Co., Toledo, O.
Trout, H. G., Buffalo, N. Y.
Ward, Chas., Engineering Works, Charleston, W. Va.

ENGINES.

(Mooring.)

Chase Machine Co., Cleveland, O.
Williamson Brothers Co., Philadelphia, Pa.

ENGINES.

(Steering.)

Century Engrg. Co., Ogdensburg, N. Y.
Williamson Brothers Co., Philadelphia, Pa.

EVAPORATORS.

Griscom-Spencer Co., New York, N. Y.

EXTRACTORS.

(Grease.)

Griscom-Spencer Co., New York, N. Y.

FASTENERS.

(Hatch.)

Lundin, A. P., New York, N. Y.
Nacey & Hynd, Cleveland, O.

FILTERS.

(Feed Water.)

Griscom-Spencer Co., New York, N. Y.
Ross Valve Mfg. Co., Troy, N. Y.

FITTINGS.

(Boiler.)

National Tube Co., Pittsburg, Pa.

FITTINGS.

(Pipe.)

National Tube Co., Pittsburg, Pa.

FIXTURES.

(Lamp, Oil and Electric.)

General Electric Co., Schenectady, N. Y.

FORGING.

(Crank, Propeller or Thrust.)

Fore River Ship Building Co., Quincy, Mass.

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Lorain Coal & Dock Co., Lorain, O.
Parker Bros. Co., Ltd., Detroit, Mich.
Pickands, Mather & Co., Cleveland, O.
Pittsburg Coal Co., Cleveland, O.
Smith & Co., Stanley B., Detroit, Mich.

FURNACES.

(For Boilers.)

Ballin Water Tube Boiler Co., Portland, Ore.
Continental Iron Works, New York, N. Y.

GAGES.

(Water.)

Michigan Lubricator Co., Detroit, Mich.
Penberthy Injector Co., Detroit, Mich.

GEARS.

(Steering.)

Akers Steering Gear Co., Chicago, Ill.
American Ship Building Co., Cleveland, O.
American Ship Windlass Co., Providence, R. I.
Chase Machine Co., Cleveland, O.
Dake Engine Co., Grand Haven, Mich.
Detroit Ship Building Co., Detroit, Mich.
Hyde Windlass Co., Bath, Me.
Sheriffs Mfg. Co., Milwaukee, Wis.
Standard Chain Co., Pittsburg, Pa.

GENERATORS.

General Electric Co., Schenectady, N. Y.

GRAPHITE.

Dixon Crucible Co., Joseph, Jersey City, N. J.

GRAPHITE.

(Lubricating.)

Dixon Crucible Co., Joseph, Jersey City, N. J.

GYPSEYS.

(Steam.)

American Ship Windlass Co., Providence, R. I.

HAMMERS.

(Steam.)

Chase Machine Co., Cleveland, O.

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(Marine.)

Baker & Co., Howard H., Buffalo, N. Y.
Erie Mill & Marine Supply Co., Buffalo, N. Y.
Lundin, A. P., New York City.
Upson-Walton Co., Cleveland, O.

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(Feed-Water.)

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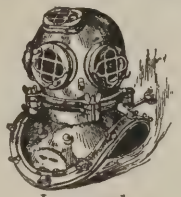
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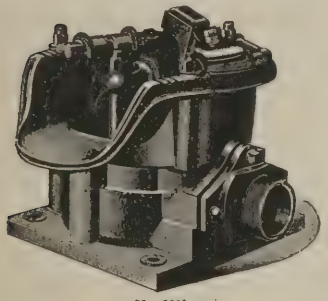
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Dake Engine Co., Grand Haven, Mich.
General Electric Co., Schenectady, N. Y.
Hyde Windlass Co., Bath, Me.
Williamson Brothers Co., Philadelphia, Pa.

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Dake Engine Co., Grand Haven, Mich.

HOISTS.
(Electric.)
Brown Hoisting Machinery Co., Cleveland, O.
General Electric Co., Schenectady, N. Y.
Williamson Brothers Co., Philadelphia, Pa.

HOISTS.
(Pneumatic.)
Brown Hoisting Machinery Co., Cleveland, O.
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(For Engine.)
McNab Indicator Co., Bridgeport, Conn.

INDICATORS.
(Pneumatic.)
McNab Indicator Co., Bridgeport, Conn.

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American Injector Co., Detroit, Mich.
Jenkins Bros., New York, N. Y.
Penberthy Injector Co., Detroit, Mich.

INSTRUMENTS.
(Nautical.)
McNab Indicator Co., Bridgeport, Conn.
Ritchie, E. S., & Sons, Brookline, Mass.
Schuette Recording Compass Co., Manitowoc, Wis.

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Hawgood & Co., W. A., Cleveland, O.
Hutchinson & Co., Cleveland, O.
McCarthy, T. R., Montreal, Can.
McCurdy, Geo. L., Chicago, Ill.
Mehl, Edward, Erie, Pa.
O'Connor, J. J., Port Arthur, Ont.
Parker Bros. Co., Ltd., Detroit, Mich.
Richardson, W. C., Cleveland, O.
Sullivan & Co., D., Chicago, Ill.
Vance & Joys Co., Milwaukee, Wis.
Willcox, Peck & Hughes, New York, N. Y., Cleveland, O., Chicago, Ill.

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(Pig.)
Hanna & Co., M. A., Cleveland, O.
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(Cork.)
Armstrong Cork Co., Pittsburg, Pa.
Kahnweiler's Sons, David, New York, N. Y.

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Atlantic Works, Incorporated, Philadelphia, Pa.

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(Expansion.)
National Tube Co., Pittsburg, Pa.

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(Ship.)
Baker & Co., Howard H., Buffalo, N. Y.
Erie Mill & Marine Supply Co., Buffalo, N. Y.
Upson-Walton Co., Cleveland, O.

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(Arc.)
General Electric Co., Schenectady, N. Y.

LANTERNS.
(Buoy.)
Safety Car Heating & Lighting Co., New York.

LAUNCHES.
Drein, Thos., & Son Co., Wilmington, Del.
Lundin, A. P., New York, N. Y.

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Cory & Son, Chas., New York, N. Y.
General Electric Co., Schenectady, N. Y.

LIGHTS.
(Search.)
General Electric Co., Schenectady, N. Y.

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Lundin, A. P., New York, N. Y.
Schuette Recording Compass Co., Manitowoc, Wis.
Walker & Sons, Thomas, Birmingham, Eng.

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Michigan Lubricator Co., Detroit, Mich.
Penberthy Injector Co., Detroit, Mich.

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Martin-Barriss Co., Cleveland, O.

MACHINERY.
(Coal and Ore Handling.)
Bartlett, C. O., & Snow Co., Cleveland, O.
Brown Hoisting Machinery Co., Cleveland, O.
Hayward Co., New York, N. Y.

MACHINERY.
(Dredging.)
Chase Machine Co., Cleveland, O.
Hayward Co., New York, N. Y.
Superior Iron Works, Superior, Wis.
Williamson Brothers Co., Philadelphia, Pa.

MACHINERY.
(Ice.)
Great Lakes Engineering Wks., Detroit, Mich.
Roelker, H. B. New York, N. Y.

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(Marine.)
American Ship Building Co., Cleveland, O.
Chase Machine Co., Cleveland, O.
Chicago Ship Building Co., Chicago, Ill.
Clyde Ship Building & Engineering Co., Port Glasgow, Scotland.
Collingwood Ship Building Co., Collingwood, Ont.
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Moran Co., The, Seattle, Wash.
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Sheriffs Mfg. Co., Milwaukee, Wis.
Superior Iron Works Co., Superior, Wis.
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MACHINISTS.
Chase Machine Co., Cleveland, O.
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(Electric.)
General Electric Co., Schenectady, N. Y.

MOTORS.
(Winch.)
General Electric Co., Schenectady, N. Y.

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Atlantic Works, Incorporated, Philadelphia, Pa.

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Davey, W. O., & Sons, Jersey City, N. J.
Stratford Oakum Co., Geo., Jersey City, N. J.

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Dixon Crucible Co., Joseph, Jersey City, N. J.

ORE.
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Pickands, Mather & Co., Cleveland, O.

PACKING.
Home Rubber Co., Trenton, N. J.
Jenkins Bros., New York, N. Y.
Katzenstein, L., & Co., New York, N. Y.
Revere Rubber Co., Boston, Mass.

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(Metallic.)
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Gillett & Eaton, Lake City, Minn.

PATENTS.
Siggers & Siggers, Washington, D. C.

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Baker, Howard H., & Co., Buffalo, N. Y.
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National Tube Co., Pittsburg, Pa.

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(Electric Light and Power.)
General Electric Co., Schenectady, N. Y.

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(Electric.)
General Electric Co., Schenectady, N. Y.

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(For Various Purposes.)
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Kingsford Fdry. & Mch. Co., Oswego, N. Y.
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Empire Ship Building Co., Buffalo, N. Y.
Fore River Ship Building Co., Quincy, Mass.
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Great Lakes Engineering Wks., Detroit, Mich.
Johnston Bros., Ferrysburg, Mich.
Kingston Ship Building Co., Ltd., Kingston, Ont.
Manitowoc Dry Dock Co., Manitowoc, Wis.
Moran Co., Seattle, Wash.
Milwaukee Dry Dock Co., Milwaukee, Wis.
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Erie Mill & Marine Supply Co., Buffalo, N. Y.
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Atlantic Works, Incorporated, Philadelphia, Pa.

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Buffalo Dry Dock Co., Buffalo, N. Y.
Clyde Ship Building & Engineering Co., Port Glasgow, Scotland.
Collingwood Ship Building Co., Collingwood, Ont.
Chicago Ship Building Co., Chicago, Ill.
Cowles Shipyard, Benj. L., Buffalo, N. Y.
Detroit Ship Building Co., Detroit, Mich.
Empire Ship Building Co., Buffalo, N. Y.
Fletcher Co., W. & A., Hoboken, N. J.
Fore River Ship Building Co., Quincy, Mass.
Great Lakes Engineering Wks., Detroit, Mich.
Johnston Bros., Ferrysburg, Mich.
Kingston Ship Building Co., Ltd., Kingston, Ont.
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Maryland Steel Co., Sparrow's Point, Md.
Milwaukee Dry Dock Co., Milwaukee, Wis.
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Tietjen & Lang Dry Dock Co., Hoboken, N. J.
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Nacey & Hynd, Cleveland, O.
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Erie Mill & Marine Supply Co., Buffalo, N. Y.
Jenkins Bros., New York, N. Y.
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National Tube Co., Pittsburg, Pa.
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American Ship Windlass Co., Providence, R. I.

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Nacey & Hynd, Cleveland, O.
Parker Bros. Co., Ltd., Detroit, Mich.

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(Marine.)
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Erie Mill & Marine Supply Co., Buffalo, N. Y.
Griscom-Spencer Co., New York, N. Y.
Upson-Walton Co., Cleveland, O.

SURVEYORS.
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Curr, Robert, Cleveland, O.
Ekstrom, G., Detroit, Mich.
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Hunt & Co., Robt. W., Chicago, Ill., and New York, N. Y.
Kidd, Joseph, Duluth, Minn.
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Parker Bros. Co., Ltd., Detroit, Mich.
Wood, W. J., Chicago, Ill.

SWITCHBOARDS.
General Electric Co., Schenectady, N. Y.

TANKS.
National Tube Co., Pittsburg, Pa.

TANKS.
(Marine.)
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TENONERS.
Atlantic Works, Incorporated, Philadelphia, Pa.

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Ekstrom, G., Detroit, Mich.
Furstenau, M. C., Philadelphia, Pa.
Hunt & Co., Robt. W., Chicago, Ill., and New York, N. Y.
Kidd, Joseph, Duluth, Minn.
Nacey & Hynd, Cleveland, O.
Wood, W. J., Chicago, Ill.

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TIMBER.
(Ship.)
Martin-Barriss Co., Cleveland, O.

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Donnelly Salvage & Wrecking Co., Kingston, Ont.

TRAPS.
(Steam.)
National Tube Co., Pittsburg, Pa.

TUBES.
National Tube Co., Pittsburg, Pa.

TUBING.
(Seamless.)
National Tube Co., Pittsburg, Pa.

TUGS.
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Donnelly Salvage & Wrecking Co., Kingston, Ont.

TURBINES.
(Marine.)
Bath Iron Works, Bath, Me.

TWINE AND YARN.
(Tarred Sisal.)
Columbian Rope Co., Auburn, N. Y.

UNIONS.
National Tube Co., Pittsburg, Pa.

VALVES.
Ashton Valve Co., Boston, Mass.
Jenkins Bros., New York, N. Y.
Nacey & Hynd, Cleveland, O.
National Tube Co., Pittsburg, Pa.
Penberthy Injector Co., Detroit, Mich.
Ross Valve Mfg. Co., Troy, N. Y.

VALVES.
(For Water and Gas.)
Ashton Valve Co., Boston, Mass.
National Tube Co., Pittsburg, Pa.
Ross Valve Mfg. Co., Troy, N. Y.

VESSELS.
(Steel.)
Bath Iron Works, Bath, Me.

VESSELS FOR SALE.
(Steam.)
Boland & Cornelius, Buffalo, N. Y.
McCarthy, T. R., Montreal, Can.
Mehl, Edw., Erie, Pa.
Richardson, W. C., Cleveland, O.

WATERPROOF CLOTH.
Bunker, E. A., New York, N. Y.

WELDING.
(Flue.)
Fix's S., Sons, Cleveland, O.

WELDING PROCESSES.
Goldschmidt Thermit Co., New York, N. Y.

WHEELS.
(Propeller.)
American Ship Building Co., Cleveland, O.
Case & Son, A. Wells, Highland Park, Conn.
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Fore River Ship Building Co., Quincy, Mass.
Great Lakes Engineering Wks., Detroit, Mich.
Hyde Windlass Co., Bath, Me.
Milwaukee Dry Dock Co., Milwaukee, Wis.
Newport News Ship Building Co., Newport News, Va.
Roelker, H. B., New York, N. Y.
Sheriffs Mfg. Co., Milwaukee, Wis.
Superior Ship Building Co., W. Superior, Wis.
Toledo Ship Building Co., Toledo, O.
Trout, H. G., Buffalo, N. Y.

WINCHES.
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Chase Machine Co., Cleveland, O.
Hyde Windlass Co., Bath, Me.
Lidgerwood Mfg. Co., New York, N. Y.
Williamson Brothers Co., Philadelphia, Pa.

WINDLASSES.
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American Ship Windlass Co., Providence, R. I.
Dake Engine Co., Grand Haven, Mich.
Hyde Windlass Co., Bath, Me.

WIRE.
American Steel & Wire Co., Chicago, Ill., and New York, N. Y.

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(Cabin and Cabinet Finishing.)
Martin-Barris Co., Cleveland, O.

WORK.
(Submarine.)
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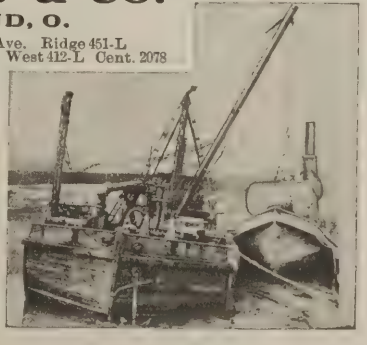

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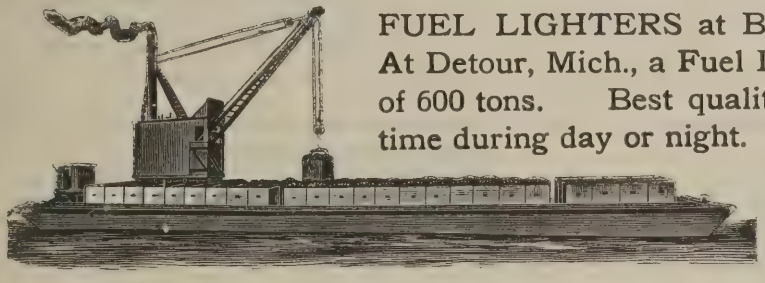

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PROPOSALS FOR DREDGING.—U. S. Engineer Office, 813 Prospect Ave., S. E., Cleveland, O., September 24, 1910. Sealed proposals for dredging Sandusky Harbor, O., will be received at this office until 10 o'clock A. M., November 1, 1910, and then publicly opened. Information on application. John Millis, Col., Engrs.

PROPOSALS FOR EXTENDING STONE jetty. U. S. Engineer Office, 813 Prospect Ave., S. E., Cleveland, O., September 24, 1910. Sealed proposals for extending stone jetty at Sandusky Harbor, Ohio, will be received at this office until 10 o'clock a. m., Nov. 4, 1910, and then publicly opened. Information on application. John Millis, Col., Engrs.

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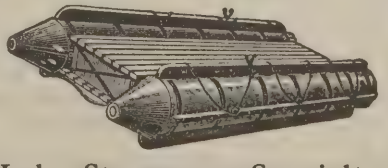

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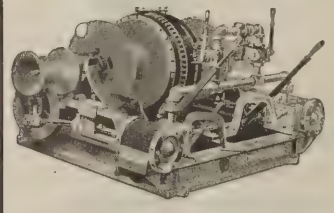

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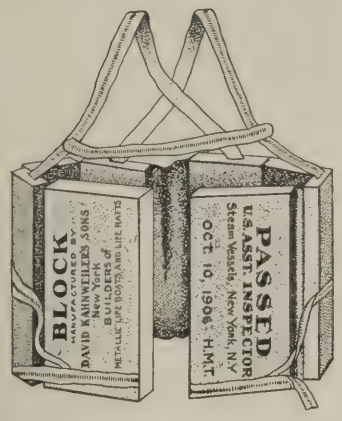

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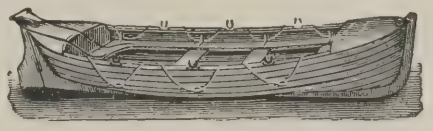

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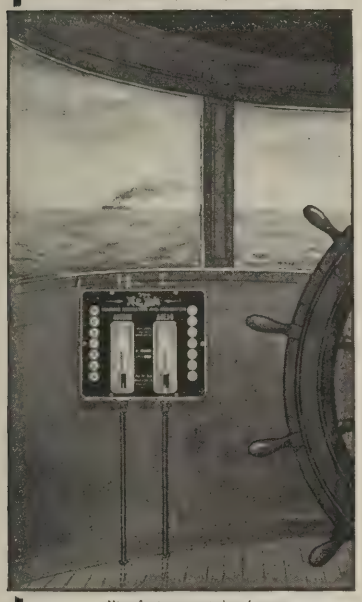

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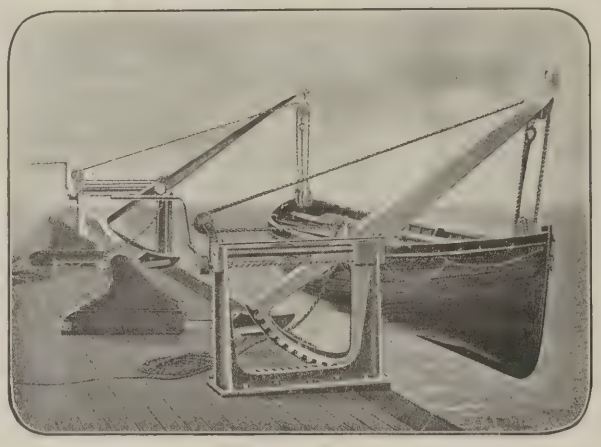

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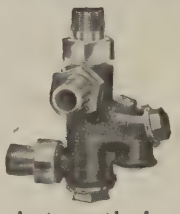

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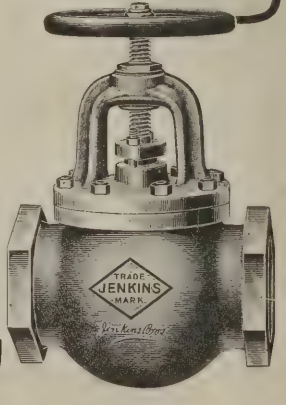

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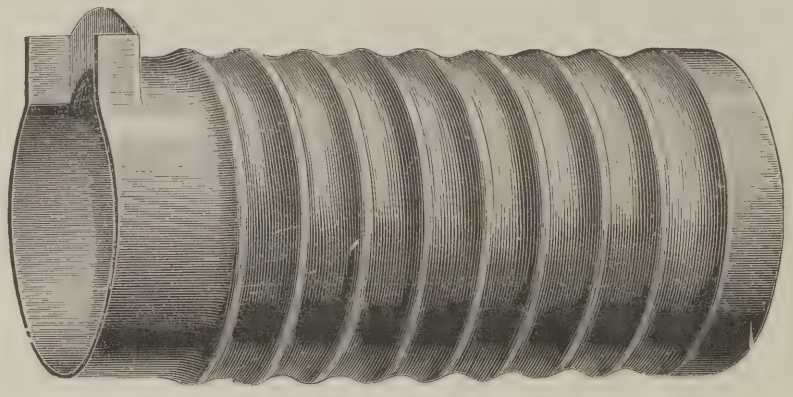

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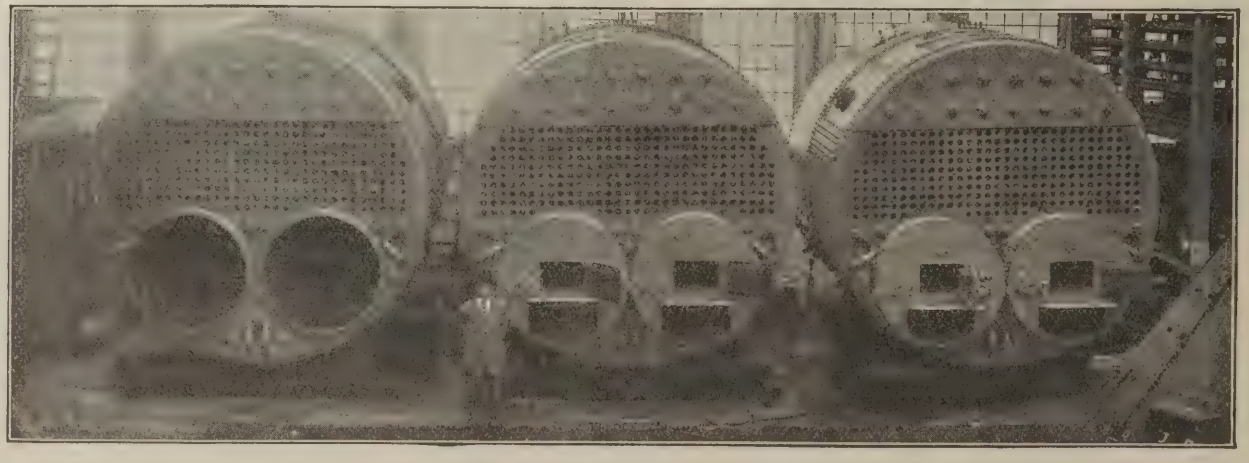

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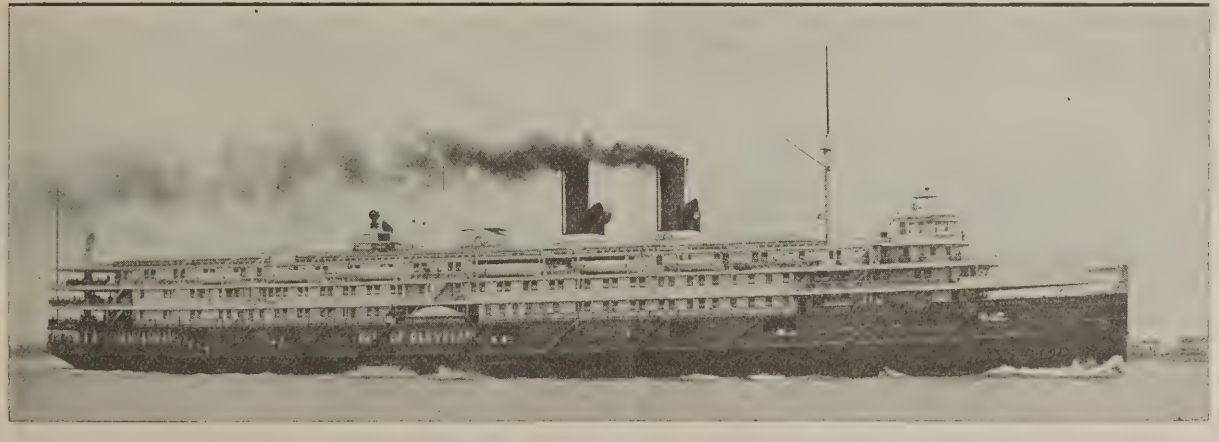

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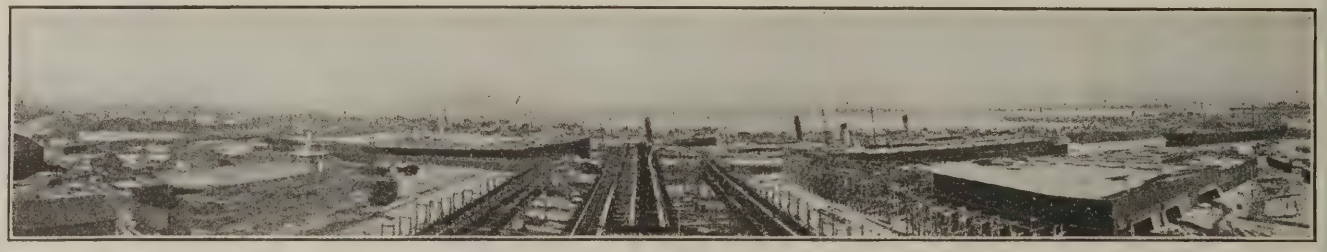

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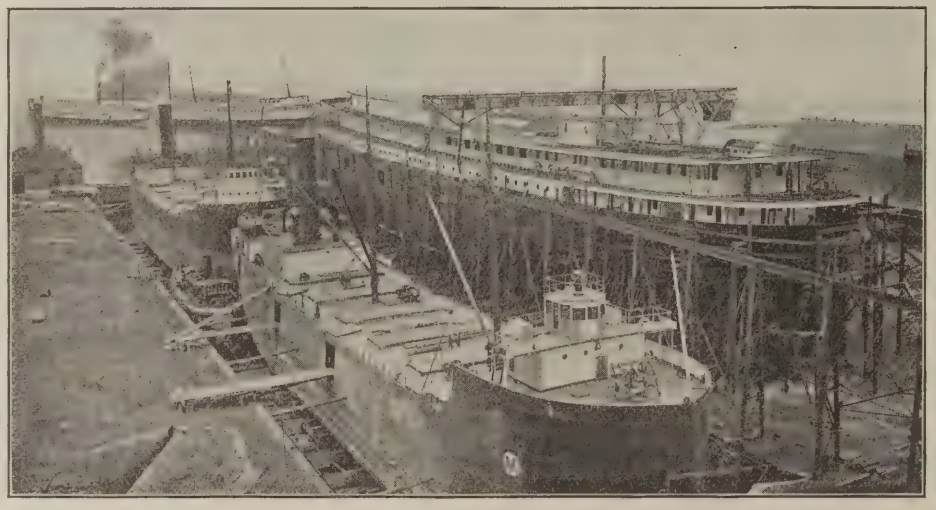

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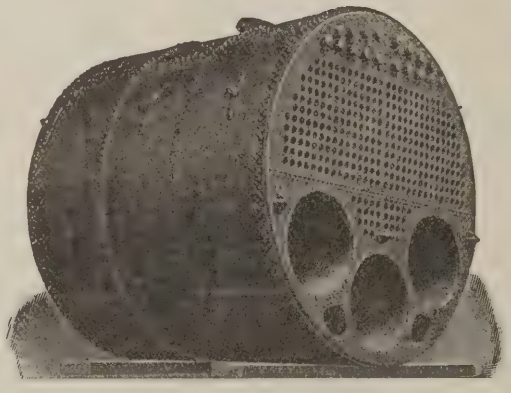

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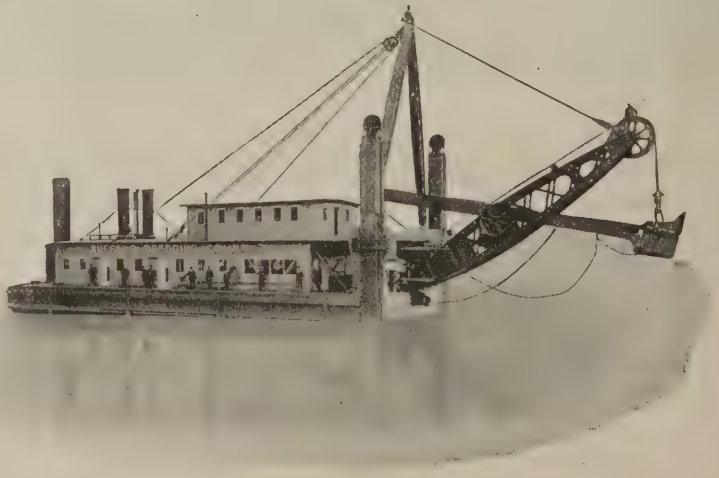

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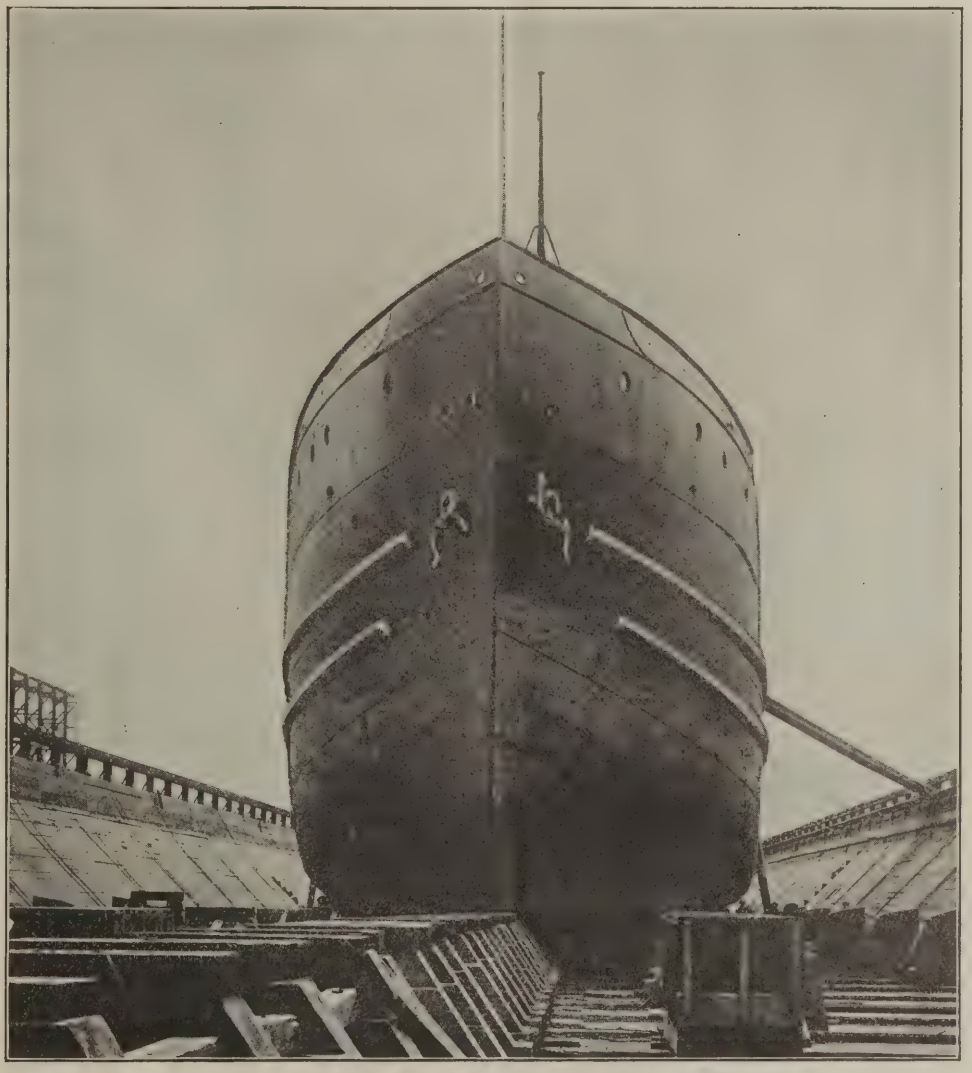

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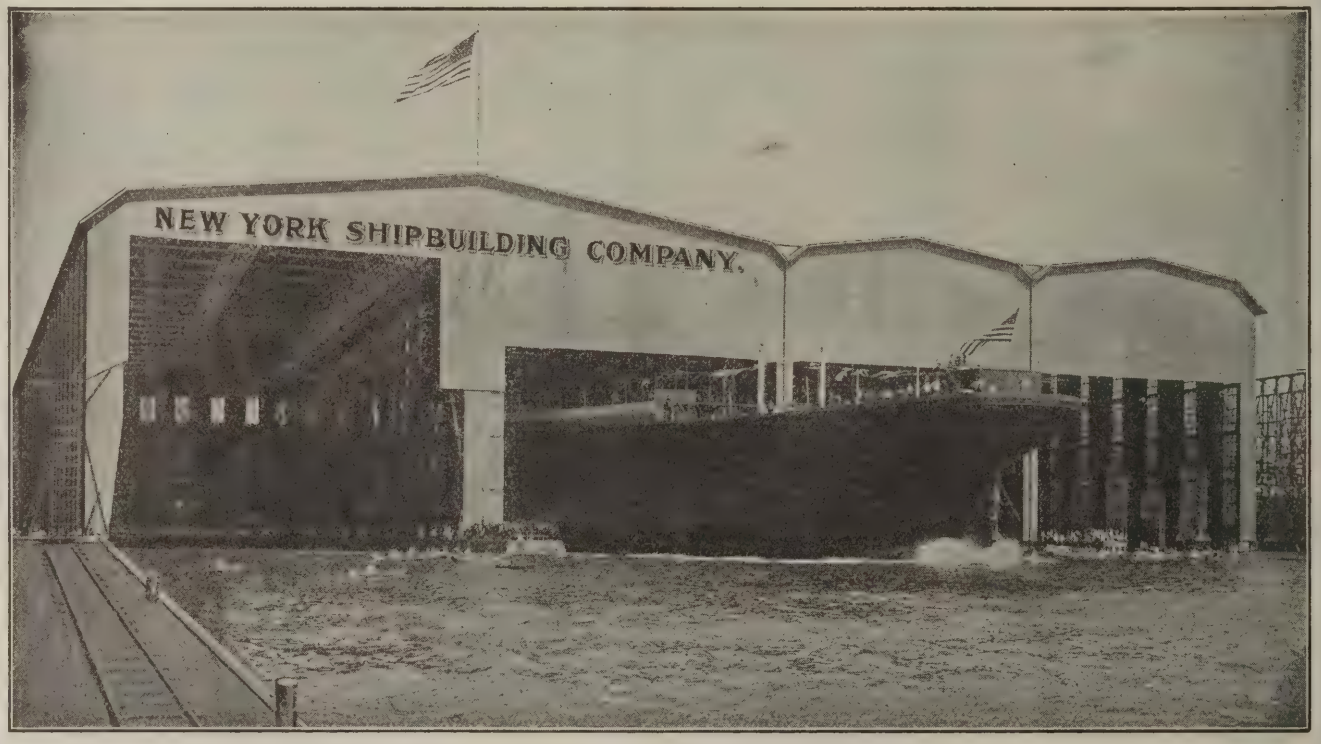

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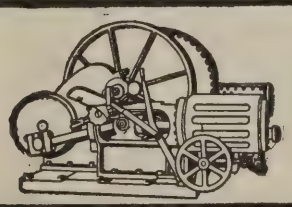
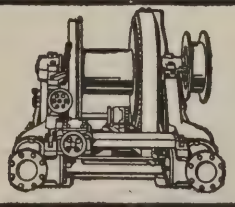
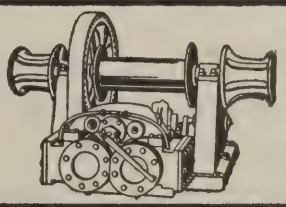

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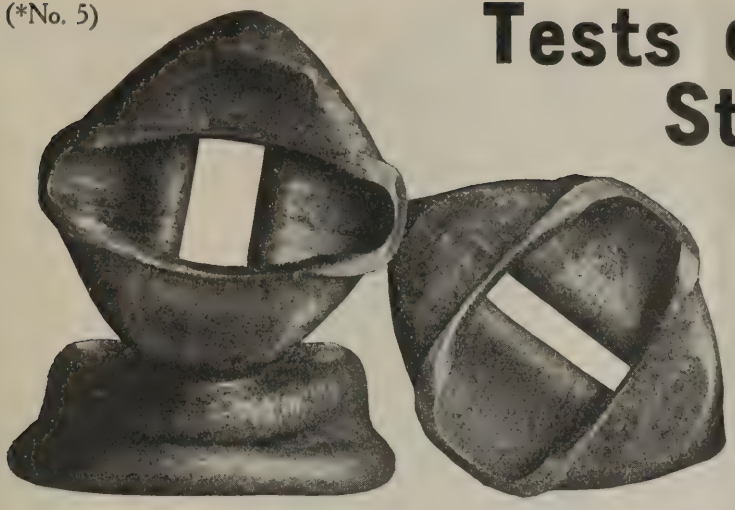

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Specimens, 2½″ long, crushed by repeated blows of a steam hammer. This test shows that the tube will stand extreme punishment without evidence of defects. Should the weld open or wall fracture, such a tube is rejected.

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*This is the fifth of a series of announcements in reference to the qualities of and tests given to SPELLERIZED STEEL BOILER TUBES

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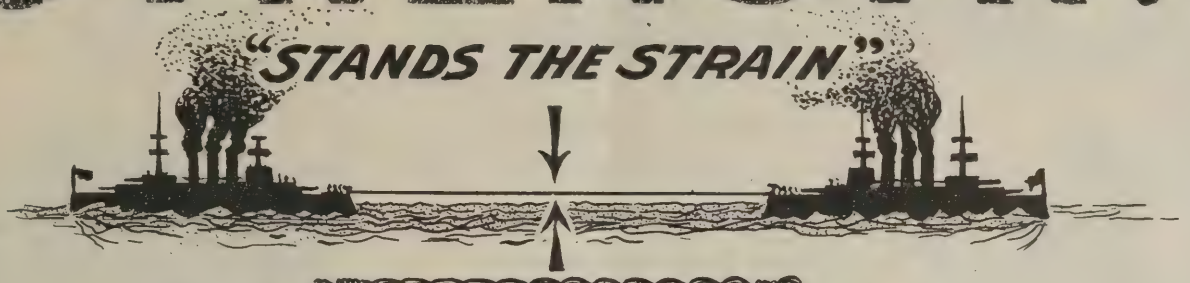
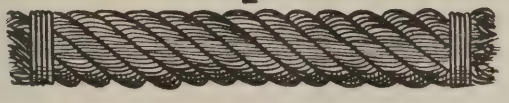


ESTABLISHED  1865

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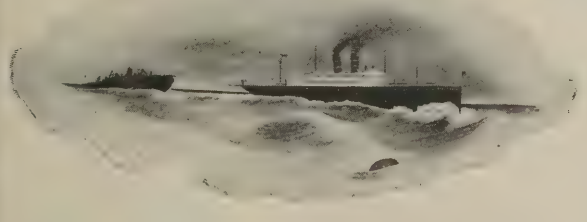

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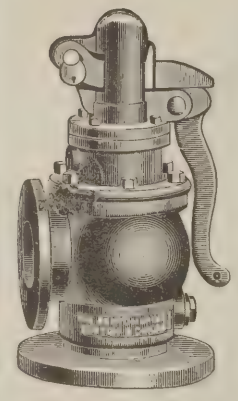

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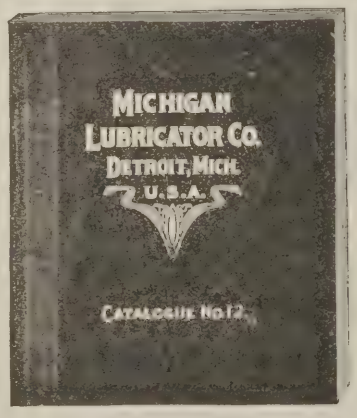

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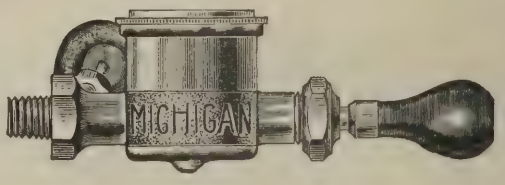

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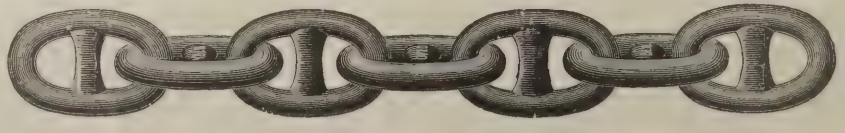

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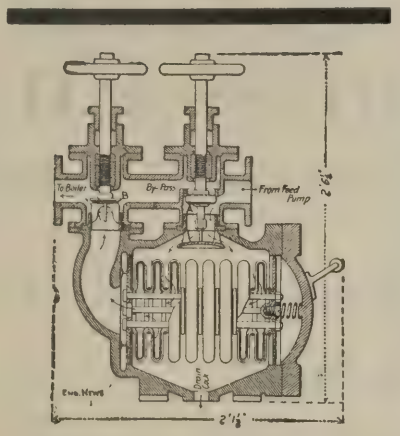

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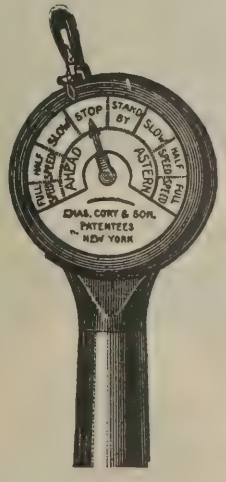

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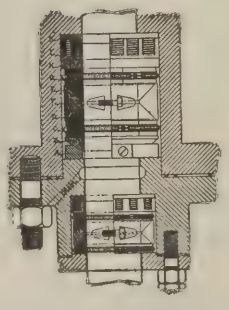

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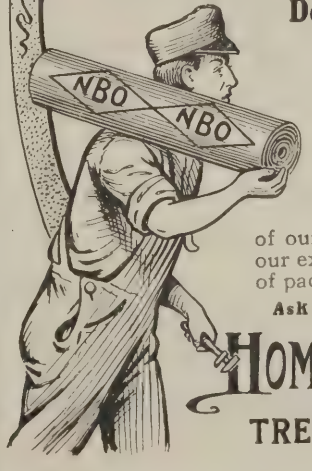

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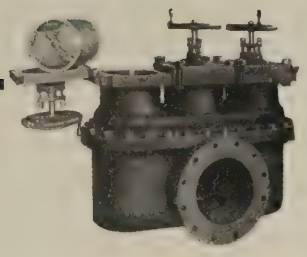

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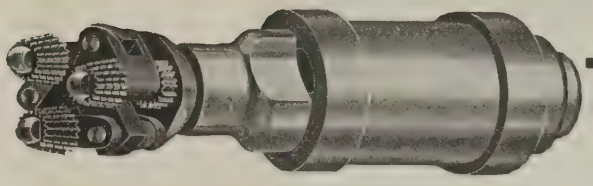

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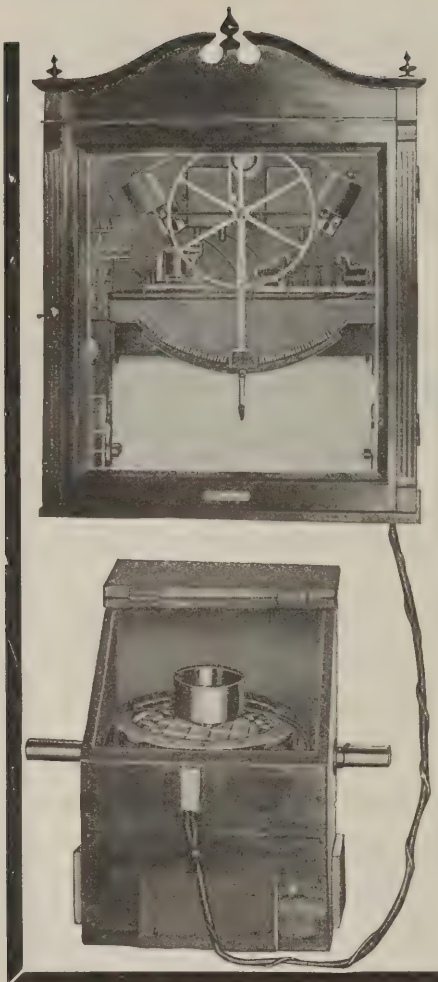

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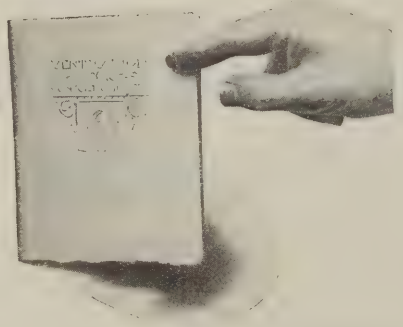

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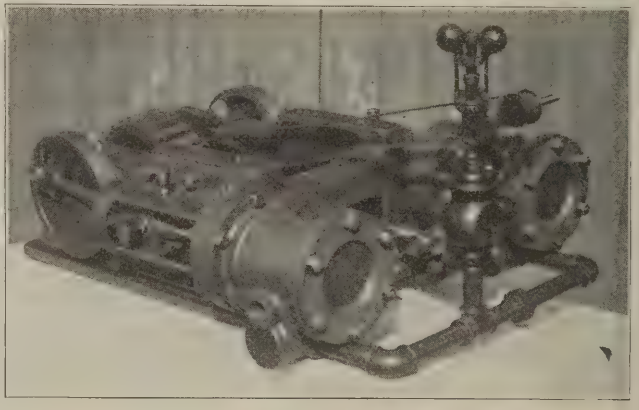

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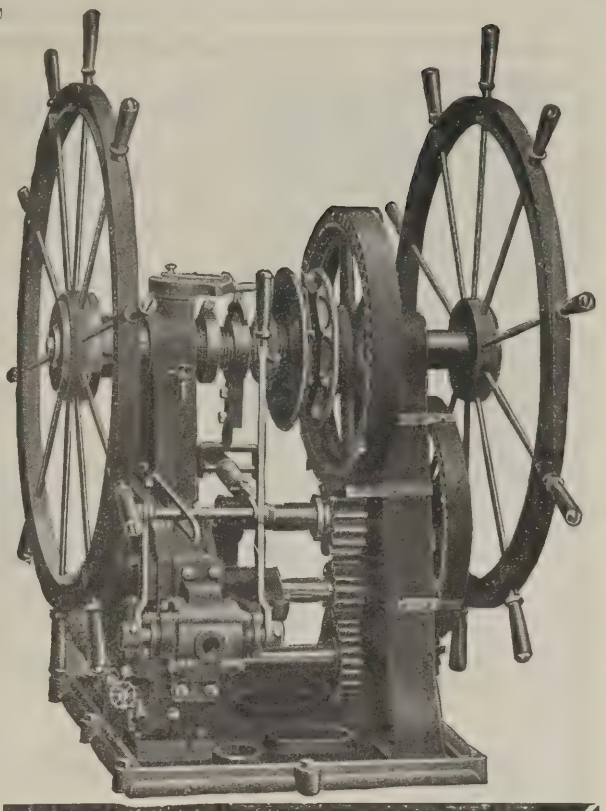

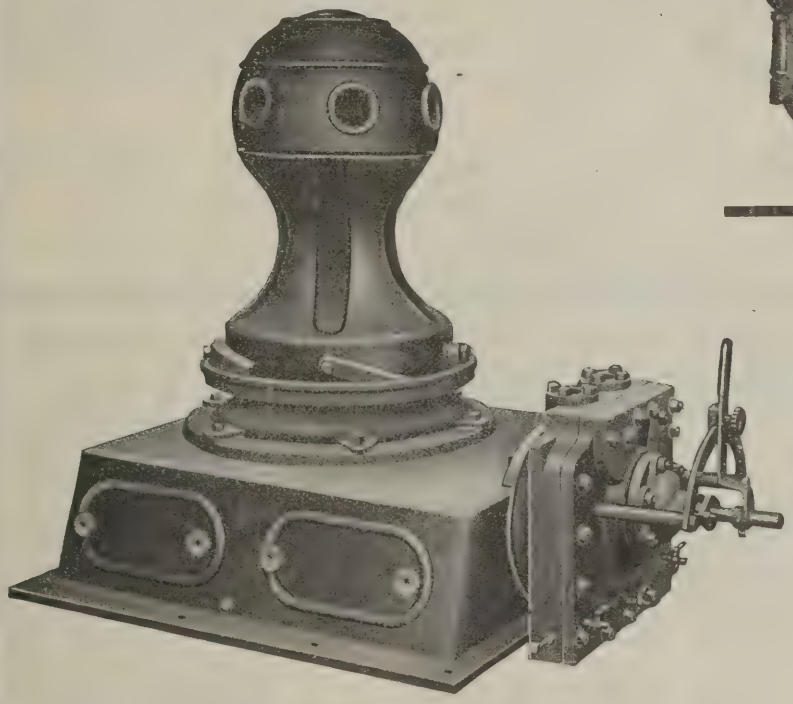

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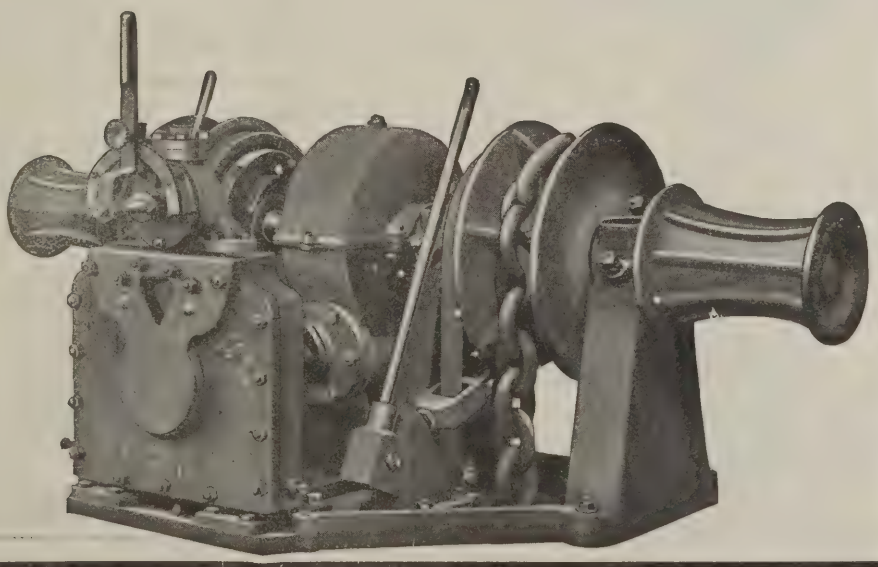

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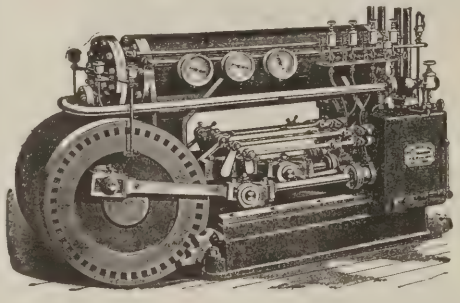

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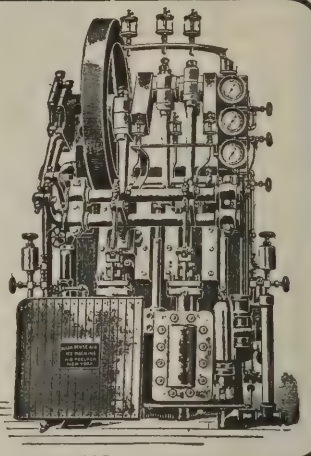

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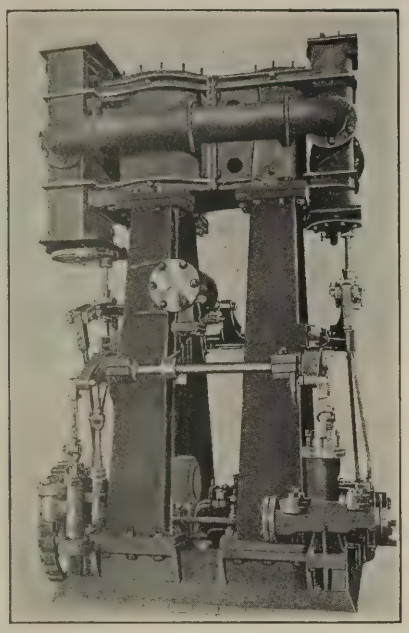

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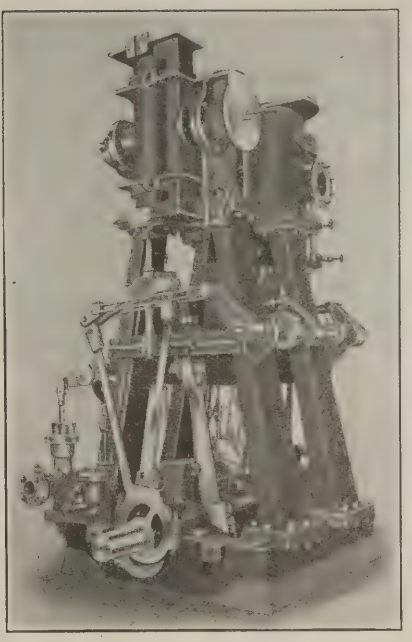

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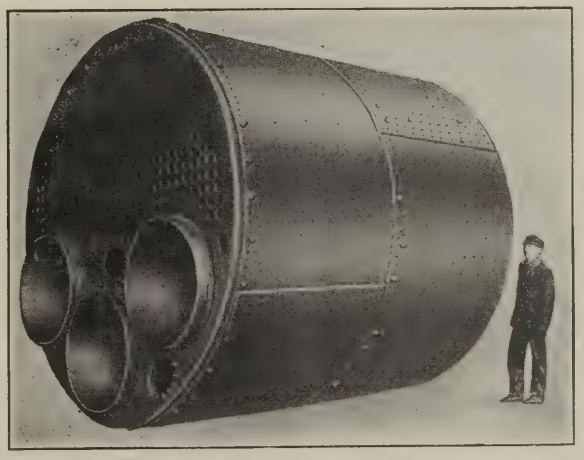

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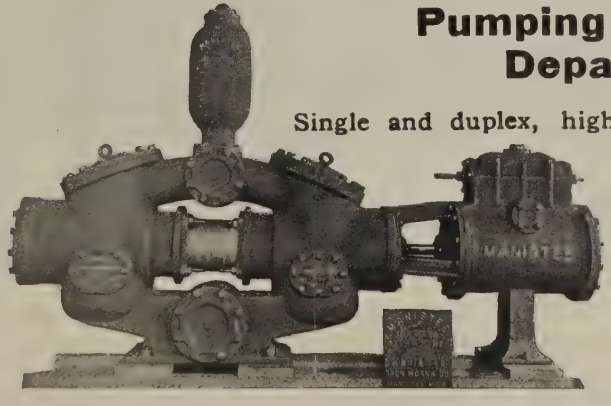

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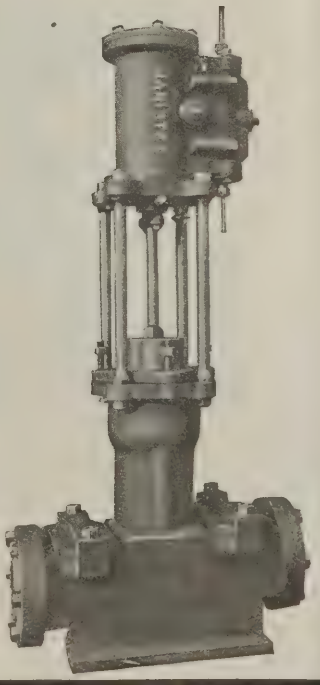

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VOL. 40. CLEVELAND NOVEMBER, 1910. NEW YORK No. 11

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Their principal dimensions are as follows:

Length over all, 430 ft.; length on load water line, 412 ft.; beam, molded, 53 ft.; depth, molded, to hurricane deck, 36 ft.; depth, molded, to main deck, 28 ft.

They are single-screw steel steamships of the ocean-going, hurricane deck type, with straight stem and semi-elliptical stern, and are schooner rigged with two steel pole masts. There are three complete decks to the hull and a partial orlop deck forward. All accommodations are located above the hurricane deck, in steel deck houses, those for the officers and engineers amidships and those for the seamen and firemen aft. There is a double bottom under the engine room and thrust recess, the compartments of which are used for carrying fresh water for boiler feed, elsewhere the ordinary type of single bottom construction is used. The hull is sub-

S. S. El Mundo, of the Southern Pacific Co.'s Fleet.

divided into compartments by six watertight bulkheads, in addition to which there are also two non-watertight bulkheads, forming athwartship coal bunkers. The three main boilers are double-ended and are located in one compartment with two athwartship firerooms, and with one cross bunker located at the forward end and one between the engine and boiler rooms. The space abreast the machinery casings on the lower deck is also used for coal bunkers.

The general construction of the hull consists of channel side frames, all extending to the hurricane deck, complete lower and main decks of steel, and steel stringers and tie plates on the hurricane and orlop decks. The strength of the hurricane deck in way of the "over all" hatches is maintained by heavy portable stringers and two tie plates. These stringers and tie plates are rigidly connected to steel castings, which are securely fastened to the deck on the forward and after sides of the hatches. The hurricane deck is laid with a 3½-in., an the orlop deck with a 3-in., yellow pine caulked deck. On two of the vessels the main deck has a 3½-in. yellow pine caulked deck on top of the plating, this wood deck being covered with 1¼-in. yellow pine sheathing. All deck beams are channels, supported by two rows of longitudinal girders with wide-spaced stanchions. From the keel to the load water line, the shell plating is joggled; above the water line it is fitted in inside and outside strakes.

The overhang at the stern is finished with a double knuckle which, with the large amount of sheer both forward and aft, give the vessels a graceful appearance. The deck houses are of steel construction, fitted with metal doors and airports.

Quick Handling of Freight.

Economical and quick handling of freight is something which is always sought for in freight steamships, though not always obtained. On these new vessels the special arrangements provided in the way of hatches, cargo ports, wide-spaced stanchions, etc., attain this end. In each of the decks, there are four large hatches, two forward and two aft. Two of the hatches on the hurricane deck are "over all" hatches which, when opened in conjunction with the cargo ports directly underneath, afford splendid openings for the mechanical conveyors which are used in handling the cargo. These hatches are each fitted with watertight steel covers in four sections, the inboard sections being hinged. The other two hatches on the hurricane deck and the four hatches on the main deck also have hinged watertight steel covers All these steel hatch covers are handled by the cargo booms. There are four cargo ports on each side between the lower and main decks, each fitted with watertight hinged doors in two sections, divided horizontally. There are also four cargo ports on each side between the main and hurricane decks, the watertight hinged doors for which are divided vertically. These ports are all located to suit the gangways at the Southern Pacific terminals.

For handling cargo through the hatches, there are two cargo booms on each side of each mast, the foremast being located between the two forward hatches and the mainmast between the two after ones. Each cargo boom is directly attached to the mast and has a lifting capacity of 7½ tons; the length of the booms varies from 47 ft. 3 in. to 57 ft. 6 in. At each hatch on the main deck, there are located two single-drum, 9-in. x 10-in., single-cylinder winches, one for each cargo boom. These winches are all fitted with vertical shafts and gearing for driving vertical gypsies on the deck above.

Arrangements for Coaling.

As customary on vessels trading between New York and ports on the Gulf of Mexico, all the coaling is done in New York, so that bunkers of sufficient capacity for a round trip are provided. The total bunker capacity is divided approximately even between upper and lower bunkers so that on the north-bound trip the coal is all carried in the lower bunkers and the upper bunkers are available for cargo. Large hinged watertight doors are fitted in the end bulkhead of this space to make it thus available. For coaling the vessels, four hinged ports are fitted on each side, between the main and hurricane decks, through which ports coal is taken on from barges by means of buckets, handled by coaling booms, located at the hurricane deck level. These coaling booms have leads to two single-drum, 8-in. x 8-in., single-cylinder coaling winches, located in the deck house between the engine and boiler casings. A large number of 24-in. diameter coaling scuttles are fitted in the main deck, through which the coal is dumped directly into the bunkers. A number of square hatches are fitted in the lower deck for trimming coal from the upper to the lower bunkers.

Character of Accommodations.

All vessels in the Southern Pacific fleet are well and favorably known among shipping men for their fine accommodations. This high standard is maintained on the new vessels, which in some respects have more elaborate quarters than the older ones. The captain's and deck officers' quarters are in a house on top of the forward hurricane deck house and the pilot house is above the officers' deck house, a flying bridge being located at the level of the top of the latter. The captain's quarters consist of an office and separate stateroom, finished in mahogany, with a private bath off the stateroom. An officers' toilet with shower bath is also provided in the upper house. A chart room is so located as to be accessible from all officers' rooms, and an inside stairway leads directly to the pilot house above. The engineers' quarters and those of the steward, petty officers, etc., are located abreast the engine casing, separate rooms being provided for all engineers. All these quarters have doors opening out on deck and the engineers' rooms also have doors opening on passages inside the deck house. A bath tub is provided for the engineers and a separate shower for petty officers.

The captain's mess room with eight seats and an officers' mess room with sixteen seats are located in the forward end of the lower deck house. The captain's mess room is paneled in mahogany and the officers' mess room is finished with a cherry wainscoting and ash panels above. The galley is located just forward of the boiler casing and is the full width of the deck house. A pantry, steward's store room and cold storage room are located between the galley and mess rooms. Separate mess rooms for firemen and seamen are located in the deck house at the sides of the boiler casing.

All quarters throughout the vessels are heated by steam and lighted by electricity. The electric plant consists of two 10-k. w. General Electric Co.'s direct connected marine generating sets, located in the lower engine room. There is a Hyde steam windlass with horizontal wildcats for handling the anchors and chains, the windlass engine also driving two warping capstans. Two similar capstans, driven by a reversible 8-in. x 8-in., double-cylinder, capstan engine, are located aft. Steam steering gear of the screw gear type is fitted, the engine having double cylinders, 10-in. x 8-in., and being controlled from the pilot house and also from the warping bridge, located at the level of the top of the after deck house. Hand-steering gear of the right and left hand screw type is located in the after deck house.

Propelling Machinery.

The propelling machinery consists of a triple-expansion engine and three double-end Scotch boilers, fitted with heated forced draft. The cylinders are 34½

in., 57 in. and 96 in. diameter respectively, and have a common stroke of 60 in. A separate liner is fitted in the h. p. cylinder. One piston valve is fitted for the h. p., two-piston valves for the m. p., and a double-ported slide valve for the l. p. All valves are worked by Stephenson double-bar link motion, fitted with the direct type of steam reversing gear. Cast iron pistons are used in the h. p. and m. p. cylinders, and a cast steel piston in the l. p. cylinder. Piston rods, cross-heads, and connecting rods are forged steel, the cross-heads have double slippers of cast iron, lined with white metal. The cylinders are supported by cast iron housings of box section, and the bed plate is also cast iron, made in three sections. The crank shaft is of the built-up type in three interchangeable sections. A horseshoe type of thrust bearing is fitted and all shafting is forged steel. The propeller is sectional with a cast steel hub and four manganese bronze blades. An "Edwards" type air pump and two bilge pumps are driven from the l. p. crosshead; all other pumps are independent, as is also the surface condenser. The latter has a steel cylindrical shell with brass tubes tinned inside and out, which give a cooling surface of 9,300 sq. ft. Water is circulated through the condenser by an independent centrifugal pump, driven by a single, 12-in. x 12-in. engine. The circulating water enters the bottom of the condenser and discharges at the top.

All steam pumps are Blake and Knowles make, and comprise two main feed, one donkey, one sanitary, one deck service, and one oil pump. There is also a Reilly feed water heater and a Ross grease extractor.

The three main boilers are each 15 ft. 3 in. diameter x 22 ft. long, built for a working steam pressure of 200 lbs. Each boiler has eight 39-in. furnaces with separate combustion chambers, and 764 2¾-in. tubes. The total heating surface of the three boilers is 15,630 sq. ft., and total grate surface 410 sq. ft.

The uptakes are fitted with air heating boxes as customary with heated forced draft installations, and all boilers are connected to a common stack. For the forced draft, there are two Sturtevant fans of 60,000 cu. ft. capacity per minute each, one located in each fire room in a recess in the coal bunkers. These fans draw air from the fire rooms and discharge into the ducts around the air heating boxes, the ducts being so arranged that each fan discharges air to all the furnaces in the fire room, in which it is located. For discharging ashes overhead, there is fitted in each fire room one 6-in. See hydro-pneumatic ash ejector. A Williamson ash hoisting engine with 3½-in. x 3½-in. cylinders is also provided in the after fire room. A donkey boiler, 12 ft. 6 in. diameter by 10 ft. long, is provided for use in port. This boiler has three 39-in. furnaces, 58½ sq. ft. of grate surface, 1,541 sq. ft. of heating surface, and is built for a working steam pressure of 200 lbs.

Speed Requirement.

The contract for these vessels requires them to maintain an average sea speed of 15¼ knots for the round trip between New York and Galveston, when loaded with 4,000 long tons of cargo, in addition to fuel, water, stores, etc., the coal consumption not to exceed 1.6 lbs. per i. h. p. per hour. On her maiden trip, the El Sol averaged over 16 knots for the round trip, and the coal consumption for the trip averaged less than 1½ lbs. per i. h. p. per hour. This excellent showing is naturally very gratifying both to the owners and to the builders.

The contract for these four vessels is the fourth order of four vessels each, which have been given the Newport News company by the Southern Pacific company.

The Newport News company also built the freight and passenger steamships, Comus and Proteus, for the same owners, this making a total of eighteen large vessels they have built or are building for the Southern Pacific company. The fourteen vessels, previously built, were all built from the same model, and are 390 ft. long x 48-ft. beam x 33-ft. 9-in. depth, fitted with machinery of 4,000 i. h. p., which enable them to maintain a service speed of 14½ to 15 knots. Of these vessels, all are now in the Southern Pacific company's fleet, with the exception of the first four built, which were sold to the United States Navy during the Spanish war, and converted into the auxiliary cruisers, Yosemite, Yankee, Dixie and Buffalo.

Interesting British Salvage Feat

SALVAGE people and engineers in Britain have been much interested quite recently in the raising of the Mersey docks and harbor board dredger, Walter Glynn, which capsized in the Mersey during a heavy gale in the early part of September. The lift is the heaviest which has taken place on the Mersey, seeing that the dredger after being dismantled as much as was possible weighed over 1,500 tons, and the system adopted by the docks board's skilled salvage officers was something like that which proved so successful in the raising of the Gladiator. Fig. 1 shows the vessel as she lay on her port side at low water, and unfortunately very close up to the river wall near the Seaforth

FIG. 1—MERSEY DOCKS BOARD DREDGER, WALTER GLYNN, CAPSIZED.

battery. Fig. 2 depicts the final effort to right the dredger. "Humps" or camels were pinned to the vessel at low water, so that when the tide rose they

FIG. 2—SHOWING THE DREDGER BEING LIFTED.

would lift her, while wire cables were attached to the dredger to enable powerful steam winches ashore to pull her on to an even keel. The winches ashore were embedded in concrete to a depth of 14 ft. and on the surface attached to the inside of the piles was a heavy green heart log which was intended to bear the strain of the purchase on the parbuckling wires that were used for the uprighting process. The wires from the shore winches were led over the dock wall and were made fast to the dredger on the port side on which she lay. While the enormous purchase was in operation from the shore the dock board's powerful new lifting camels of 1,000 tons capacity each with the assistance of other salvage craft were made fast with wires ranging from 200 to 230 tons breaking strain. The preparations for lifting were so carefully made that the salvage was a complete success, the dredger being placed on an even keel at the first attempt, as shown in Fig. 3.

A Big Dry Dock

The Clyde Navigation Trustees have just adopted plans for the new graving dock which has become necessary to meet the growing requirements of the port. The trustees have been assured by the British admiralty that the proposed dock would be suitable for ships of the largest type. The dimensions of the dock are 1,020 ft. long on the floor, divided into two sections of 600 ft. and 420 ft., the width of the entrance being 100 ft., and the depth on sill at average high water, spring tides, 36 ft. These dimensions may, if it is thought wise, be increased at a later stage. The capital cost is estimated roundly at $2,500,000.

FIG. 3—SHOWING THE DREDGER UPRIGHTED.

ORGANIZATION OF A NAVY YARD SAIL LOFT AND FLAG SHOP

By Holden A. Evans.[1]

IN PREVIOUS articles in THE MARINE REVIEW[2], I have described the organization of some navy yard shops in which at least some of the principles of scientific management have been followed.

In the sail loft, awnings, hammocks, sails, coaling bags, clothes bags and similar canvas work, are manufactured and repaired. In the flag shop, flags of all nations, curtains, table cloths, table linen and similar work, are manufactured and repaired.

In the sail loft skilled sailmakers are employed at $4.50 per day, very few of whom have worked with machines, and all work was previously done by hand. In the flag shop are employed women at $2.25 per day, nearly all of whom are expert machine hands, and a great part of the output is machine work.

In these two shops the character of the labor differs greatly, yet the same organization and the same system of work has been followed and excellent results obtained in both shops.

NO. WANTED 100 JOB ORDER NO. 2614-R

ARTICLE Coaling Bags 800 Lbs.

MAT. ORDER 5-7-10 RECEIVED 5-10-10

DIR. LAB. 202.88
MAT. 951.93
TOTAL 1154.81

PART	ROUTE	OPERATION	CHECK NO	ISSUED	COMP	HOURS
CANVAS & ROPE	1	CUT OUT ALL MATERIAL	3303	5-12	5-14	12
SIDES AND BOTTOM	2	DIAGONAL STITCH	3308	5-16	5-22	42
		JOIN, ROPE & FINISH-20 BAGS	3319	5-25	6-2	60
		" " " " " "	3323	"	"	58
ASSEMBLED PARTS		" " " " " "	3324	5-26	6-4	59
		" " " " " "	3327	"	"	61
		" " " " " "	3310	"	6-6	69

FIG. 1—ROUTE SHEET. THIS IS AN ENVELOPE AND SERVES AS A FILING POCKET FOR THE INSTRUCTION CARDS.

In this article will be described the organization of two shops, the product of which is somewhat unusual. The results which have been obtained in these shops by better methods are far beyond expectations.

[1]Naval Constructor, U. S. Navy.
[2]MARINE REVIEW, Sept., 1910.

Volume of Work Necessary.

The steel makers seek to increase tonnage to enable them to increase efficiency and reduce costs. For the same reason government shops require more work to maintain efficiency, which has been improved by better methods. In a commercial shop increased efficiency lowers costs, and enables selling costs to be shared a sufficient amount to bring more business and keep the plant fully occupied, and the workmen who have assisted in reducing the costs are assured a steady job. Not so in a government plant. There is no increase of work on account of reduction in costs, and this the employes fully understand. They know that, generally speaking, the quantity of the work will be the same whether the cost be high or low, and they view every change which tends towards efficiency as a factor which may work them out of a job. This is one of the reasons why government plants with splendid equipment cannot compete with private plants with poor equipment. It is the chief reason why it is so difficult for a navy yards manager to build up an efficient shop organization.

I have experienced these conditions in every shop where a serious effort has been made to improve the efficiency. In fact, I have usually found that when a navy yard shop is thoroughly studied and systematized that the out-

MFG DEPT NO 229
CHECK No. 3319 JOB ORDER No. 2614-R
ARTICLE 20- Coaling Bags - 800 Lbs
ISSUED 5-25 1910 COMPLETED 6-2 1910 BY Sorenson

INSTRUCTIONS
Join, rope and finish 20 Coaling bags 800 lbs

DATE	RT.	HR.	DATE	RT.	HR.	DATE	RT.	HR.	DATE	RT.	HR.	DATE	RT.	HR.
5-25	56	4	5-31	56	8									
5-26	"	8	6-1	"	8									
5-27	"	8	6-2	"	8									
5-28	"	8												
5-30	"	8												

FIG. 2—INSTRUCTION CARD ISSUED TO THE WORKMAN.

MFG DEPT NO 229
CHECK No. 3303 JOB ORDER No. 2614-R.
ARTICLE 100- Coaling Bags - 800-Lbs.
ISSUED 5-12 1910 COMPLETED 5-14 1910 BY J.O.B.

INSTRUCTIONS
Cut out sides and bottoms, fold and crease. Cut ropes to length for 100 - Coal Bags - 800 lbs

DATE	RT	HR.	DATE	RT	HR.	DATE	RT	HR	DATE	RT	HR.	DATE	RT.	HR.
5-12	62	2												
5-13	"	8												
5-14	"	2												

FIG. 3—INSTRUCTION CARD ISSUED TO THE WORKMAN.

put is so greatly increased that, notwithstanding large reductions in the force, it is difficult to find sufficient volume of work to keep the shop up to the new standard.

The sail loft and flag shop are no exceptions to this rule. In the sail loft all work had been done by hand, even plain seaming, and there was not a machine in the shop. With no reduction in the amount of work to be done, the introduction of machines and the better organization of the shop reduced the number of men by half and it was not possible to keep this number continuously employed. In the flag shop it had been the boast of the shop that there had been no reduction in the force for five or six years. Soon after this shop came under my supervision it was studied and systematized, and with no reduction in the amount of work accomplished the force was cut in half.

In these two shops, if additional volume of work can be provided, the efficiency can be further increased. Without the additional work the tendency will be to restrict the output as much as possible in order that there shall be no further reduction of the force.

No Opposition from Foremen to Improvements.

In these two shops there was no opposition from the foremen to changes. They knew that the new management had made improvements in other shops and they knew that this had been done in spite of opposition. They had also learned that the management while lowering costs, did not ask the impossible, and that it was the aim to do exact justice to every employe. These foremen, therefore, were willing to be shown that there was another and more efficient way of operating the shop, and they gave effective co-operation.

An assistant, J. M. Willis, who had been employed under my supervision for three years in shop improvement work, was assigned to this work, and the re-organization and the satisfactory results obtained were accomplished under his immediate supervision.

FIG. 4—OFFICE OF FLAG SHOP. STANDING ORDER BOARD ON THE LEFT. INSPECTION TABLE ON THE RIGHT.

Separation of Work Into Elements.

Here, as elsewhere, no attempt had previously been made to separate the work into elements, and to give each part to those best qualified for that class of work. For example, in making an intricate foreign flag, the whole job was assigned to one worker, who laid out the design, did the cutting, basting, stitching, embroidering, heading, pressing and folding. Under the new system the work was divided into the following sections: marking, cutting, basting, machining, heading and pressing; and to each section was assigned the workers best qualified for each class of work. In the sail loft similar conditions were found and similar changes were made.

Routing Work.

All work is carefully planned and routed, and written instruction cards issued. All material necessary for a job is assembled before the work is undertaken, and is delivered to the proper section at the right time. The standing order board, material order sheets, instruction card holders, etc., are the same as those described in previous articles, and no further description is given. The route sheet and instruction card differ from those used in other shops and previously described. A great deal of the output is duplicate manufacture work, and it is desirable to have accurate record of the times taken on the various operations, and also the direct cost, in such shape that comparisons can readily be made of the work accomplished. The route sheet (Fig. 1) is an envelope, on the front of which in appropriate columns the order is recorded, the operations are defined, and the assignment of the work made. When the work is completed, the dates of completion are entered and also the time taken for each operation and the total direct cost of the job. This envelope forms an excellent pocket for filing the completed instruction cards, bills of material, and other data regarding the job, the condensed information being given on the outside.

FIG. 5—FLAG SHOP. MARKING, CUTTING AND DESIGN DEPARTMENTS. NOTE INSTRUCTION CARDS AND TIME TICKETS FOR EACH WORKER.

The instruction card (Figs. 2 and 3) contains a description of the work required and has blanks in which the

workman enters his time each day until the job is completed. After the work has been inspected, the time and direct cost records are compiled from these cards and entered on the route sheet envelope and the cards are filed in the envelope. The condition of the work in the shop is shown on the standing order board, and it is by means of this board that the foreman is able to follow up the work and properly route new work.

FIG. 6—FLAG SHOP. BASTING AND MACHINE DEPARTMENTS. ALL MACHINES ARE MOTOR-DRIVEN.

Division of Work in the Sail Loft.

After the introduction of machines, the work in the shop was distributed among four departments, as follows:

(1) *Laying Out and Cutting:* This work is done under the immediate supervision of the foreman. One man does practically all laying out, cutting and the preparation of material before it goes to the operators.

(2) *Machine Department.* This includes all stitching where it is possible to use a machine.

(3) *Finishers.* Includes all finishing on the work which has passed through the machines, such as hand stitching, roping, working eyelets, grommets, rings, etc.

(4) *Hand Workers.* Includes all hand work where no part of the work is done by machine.

Flag Shop Organization.

The organization of the flag shop and the system followed is in every respect similar to that of the sail loft, except that the sub-departments are not the same. The character of the work and the various departments are shown in the photographs. (Figs. 4 to 9.)

Results Obtained.

The increase in output per worker has been very large. As this increase has been obtained under the day work system, without any pecuniary reward to the worker, the results are remarkable, and the causes are worthy of consideration. In these shops, as in the usual day work shop, no record was previously kept of the output of each worker each day. There was no way in which the manager could obtain the relative efficiency of each man other than the statement of the foreman. The same conditions exist in many shops; the foreman knows his best men and his worst men, but the majority are between these extremes and are generally classed as equal and, in case of a reduction of the force, frequently better men are discharged than those retained. Again, under these conditions, there is opportunity for favoritism which is in many cases exercised. In government shops it is usually the new man who is laid off and the older worker who is retained, notwithstanding the fact that in many cases the new man is superior to men previously employed. The workmen see no relation between the efficiency of the man and his retention.

FIG. 7—FLAG SHOP. EMBROIDERY MACHINE AND SAMPLE OF WORK.

No Attempt Made to Drive the Men. The Record Shows What Each Man Does Each Day.

In the re-organization of the two shops under discussion, no attempt was made to drive the men. In no case were the men told that the output was small, or that it should be increased, and only in one case was there an intimation that the management was not satisfied with the amount of work done.

As soon as the work was in some degree systematized, a record of the daily output of each man was made. The men themselves made these records, and they could not dispute them. The men knew from the attitude of the management in other shops that discharges would be based solely on these records, and that each man must work out his own salvation. As improvement was made and the output increased it was soon evident to the men themselves that it would be necessary to reduce the force. Previously practically all of the sailmakers in the immediate vicinity had been employed and the first cut in the force brought out the fact that it is difficult to ob-

tain work in this district. With still further improvement a second small reduction was necessary, and this left about half the original force. These men are all excellent mechanics, who can produce a large output. The majority of these owned their homes in, and had strong ties binding them to, the vicinity, and they knew that if they lost their jobs that they would have to leave their homes to obtain work. This brought about keen competition between the men, and resulted in a very large output. These conditions make this shop an exception to the usual government shop, but nevertheless the results are disheartening both to the men and the management. There is finally left a splendid small body of men who, because of increased efficiency have increased the output so largely that there is not enough work to provide permanent employment.

The conditions in the flag loft among the women workers were very similar, and the results were the same.

Reductions Made in Cost.

To show what has actually been accomplished, a few of the time reductions made are given below, the names of the workmen being omitted:

Time Taken in Making Standard Navy Hammocks in Lots of Ten. All Work by Hand. Machine Work Not Allowed. Times Given Are in Minutes For One Hammock.

Workmen.	Time taken First records.	Date. 4-13-10	Date. 4-16-10	Date. 4-20-10	Date. 4-22-10
1	120	78	72	72	..
2	120	78	78	78	..
3	120	90	90	90	..
4	120	90	84	84	..
5	120	90	84	84	..
6	120	96	84	90	..
7	120	102	102	90	..
8	120	120	120	108	72
9	120	120	120	108	72
10	120	120	120	108	90
11	120	120	120	96	84
12	120	120	120	120	90
13	120	120	120	96	96
14	120	120	120	96	96

These figures are interesting. Note that workmen 1 and 2 made a marked reduction at once; 3, 4 and 5 did very well, while 6 and 7 held back. Workmen 8 to 14 determined at first that they would make no cuts, but later, facing the work done by the other men, their resolution failed and a moderate cut was made. It was then the one time that the management indicated that better output was expected. A new lot of ten hammocks was ordered of each of these men (Nos. 8 to 14). The man's check number on the instruction card was written in large red figures and the word "Conditional" was written across the face of the card in large red letters. Nothing was said to the men, but it was seen as soon as the instruction cards were issued that the men understood the warning. Nos. 8 and 9 equaled the best records, while 10, 11 and 12 made considerable improvement; 13 and 14 did not improve and were later discharged. Considerable further reduction can be made by substituting machine work for hand work, but at present the specifications prescribe hand work.

The reductions made reduced the cost of hammocks 75 cents each, and as large quantities are required, 2,000 for a single large ship, the saving affected is considerable.

The time required in making clothes bags, 2,000 of which are required for each large ship, was reduced from 60 minutes each to 36 minutes each.

The most interesting reduction, however, was made in the manufacture of 800-lb. coaling bags, shown in Fig. 10. The record of the times, taken after the material is prepared, is as follows:

Workmen.	Times first record.	Date 3-5-10	Date 4-6-10	Date 5-10-10	Date 5-16-10	Date 6-2-10	Date 6-15-10
1	390	190	...	180	180	171	132
2	390	210	195	188	180	174	156
3	390	220	214	188	180	180	156
4	390	225	210	206	180	177	...
5	390	240	206	...	180	180	132

For exactly the same work it will be seen that the time was reduced from 390 minutes per bag to 132.

Cutting out, folding and creasing, and cutting ropes to length, in lots of 100, require seven minutes each; diagonal stitching the sides and bottoms

FIG. 8—FLAG SHOP. HEADING DEPARTMENT. NOTE ELECTRIC HEATERS TO ENABLE WOMEN WORKERS TO MAKE TEA DURING THE NOON HOUR.

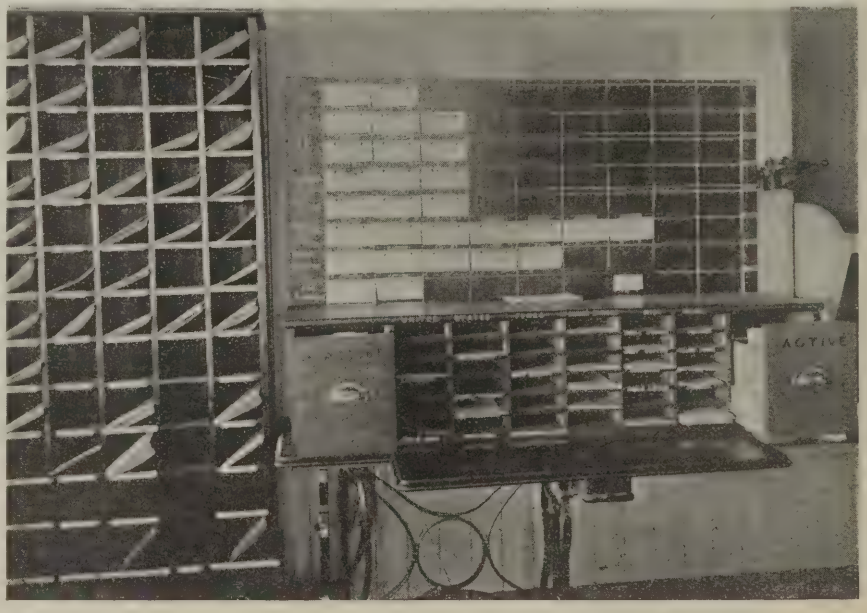

FIG. 9—FLAG SHOP. STANDING ORDER BOARD. THE FOREMAN CAN KEEP TRACK OF ALL WORK BY MEANS OF THIS BOARD. A SIMILAR BOARD IS USED IN THE SAIL LOFT.

on the machine in lots of 100 take 25 minutes each. The total time taken by the best workers to make a bag complete is therefore 2 2/3 hours. When the diagonal stitching is done by hand, the time for each bag is 3¼ hours. These bags are well made, being subjected to very hard usage in coaling ship, 800 lbs. of coal being hoisted in each bag. From the photograph the amount of work involved can be seen, and it must be admitted that to make one of these bags by hand in 3¼ hours requires skill and hard work. It is not believed that this time can be materially reduced by piece-work, and if these results are maintained there is little or no advantage, so far as this particular work is concerned, in either piece-work or the premium system. Two years ago 12 hours was taken to manufacture a bag, while a year ago it took eight hours, and this time has now been reduced to less than three hours. As the pay of sailmakers is 58 cents an hour, the saving effected is very large. Similar reductions have been made in other classes of manufacture work, and also in all repair work.

FIG. 10—EIGHT HUNDRED-POUND COAL BAG, MADE ENTIRELY BY HAND IN 3¼ HOURS. FORMER TIME, 12 HOURS.

It is difficult to believe that such large reductions can be made in work of this character, but the records are vouched for, and the performances described can be duplicated at any time. This is simply some additional proof that analysis and study of work in any shop where the usual conditions prevail will result in enormous reductions in cost.

Volatile Matter of Coal

Washington, D. C., Nov. 10.—The volatile matter of coal is the title of the first bulletin to be issued by the new federal bureau of mines. The authors, Horace C. Porter and F. K. Ovitz, conducted their investigations at the Pittsburg station while it was under the technologic branch of the geological survey, the work being a continuation of the fuel investigations begun several years ago at the Louisiana Purchase Exposition, St. Louis, Mo. The results obtained at that plant showed that the work of determining the fuel values of the coals and lignites in the United States with a view to increasing efficiency in their utilization would be incomplete if it did not include systematic physical and chemical researches into the processes of combustion. Hence in their later investigations the authors carried on such researches, concentrating attention on those lines of inquiry which promised results of greatest economic importance. This bulletin is therefore a report on an investigation of the volatile matter in several typical coals —its composition and amount at different temperatures of volitilization.

Quoted directly the authors say: "The investigation has already shown that the volatile content of different coals differs greatly in character. The volatile matter of the younger coals found in the West includes a large proportion of carbon dioxide, carbon monoxide, and water, and a correspondingly small proportion of hydrocarbons and tarry vapors. The older bituminous coals of the Appalachian region yield volatile matter containing large amounts of tarry vapors and hydrocarbons, difficult to burn completely without considerable excess of air and a high temperature. Coal of the western type, moreover, gives up its volatile matter more easily at moderate and low temperatures than that of the other type. The volatile matter produced at medium and low temperatures is rich in higher hydrocarbons of the methane type, such as ethane and propane, which contain a larger portion of carbon than is present in methane.

"These facts help to explain the difficulty of burning Pittsburg coal, for example, without smoke, the low efficiency usually obtained in burning high-volatile western coals, the advantage of a pre-heated auxiliary air supply introduced over a fuel bed, and the advantage of a furnace and boiler setting adapted to the type of fuel used. They bear directly also on the question of steaming 'capacity' of coal for locomotives, the designing and operation of gas producers for high-volatile fuels, and the operation of coke ovens and gas retorts.

"The results show further that certain bituminous coals of the interior and Rocky Mountain provinces give promise of good yields of by-products of coking, notably ammonia and high candle power gas, comparing favorably in these respects with the high grade coking coals of the eastern province.

"They show also that inert, noncombustible material is present in the volatile products of different kinds of coal to an extent ranging from 1 to 15 per cent of the coal."

The bulletin will be of interest to fuel engineers, designers and builders of gas producers, and others.

AIDS TO NAVIGATION ON THE PACIFIC COAST

IN CONSIDERING the aids to navigation, or rather the lack of them, on the Pacific coast, THE MARINE REVIEW will consider the question as a whole under the following heads: (1) Physical description; (2) Traffic; (3) Why the present aids are insufficient; (4) Effect on the development of the Pacific coast; (5) Where the trouble lies. As the Pacific coast of North America extends some 14,000 miles, physical divisions will be taken up in turn. The present article will deal with the waters of the coast from Puget Sound northward, including Alaska.

The Pacific ocean and its tributaries bound Washington, British Columbia and Alaska on the west. Washington state lies between the parallels of 45-32 and 49° latitude and the meridians of 116-57 and 124-48 west longitude. The territory or district of Alaska comprises the northwest extremity of North America, west of the 141st meridian, and a strip of the coast south to 56° of latitude, with many small and some large islands. Its area is about 590,000 square miles, and inlets and islands included, the coast line is about 26,000 miles long. From Nome to the farthest point south the coast line may be estimated at 20,000 miles. The outermost of the Aleutian islands is as far west of Skagway as that city is west of New York.

From the entrance to the strait of Juan de Fuca, northward through Puget sound, past British Columbia and into Alaska waters, is a coast line as dangerous and difficult as it is unique and beautiful. Puget sound is an arm of the Pacific ocean indenting the coast of Washington and connecting the waters on the two sides of Vancouver island.

Great Series of Islands.

North of Puget sound, beginning with Vancouver island, is a series of islands adjoining more or less closely the coast line, and including Queen Charlotte islands, off the coast of British Columbia, and from Dixon's Entrance, at the southernmost point of the Alaskan coast, to the head of the Lynn canal, a district known as the coast islands of southeastern Alaska. In a distance of 300 miles are here included the numerous islands comprising the Alexander archipelago. In the confines of the archipelago, bounded on one side by the north arm of North America and on the other by the Pacific ocean, is a series of channels and passes unequaled in the geography of the world. Contained herein is the Alaska port of entry, Juneau, and the sub-ports of Ketchikan, Wragnell, Sitka and Skagway.

Through this region a vast traffic is and has been carried on. What has the government done to provide safety for the lives of the men and the value of the cargoes that trust themselves in the routine of their duty to these waters? Practically nothing. On the Pacific coast, comparatively speaking, little has been accomplished in the way of aids to navigation, and the need is great. Some of the principal points are not even equipped with lights, in fact, at one important port on the California coast, San Pedro, where the government has just finished a waterbreak costing millions, the steamship company making regular calls has established and maintains at its own expense, a light and bell for the protection of its ships. The condition of the Alaskan coast waters, particularly southeastern Alaska, is deplorable. Why? The scope of this article is to set forth the general facts and the reasons therefor.

A Country of Vast Distances.

Physically, Alaska is a country of vast distances, unknown and undeveloped possibilities. The shores of the Arctic and Bering sea are flat and low, with a broad offing of shallow water and few places where a ship may closely approach the land. The south coast, however, is mountainous, the continuation of the littoral ranges of British Columbia making the sea front and the islands of the archipelago. These islands are separated by narrow and deep channels affording an almost unbroken protected waterway from Puget sound to Cross sound. The precipitous coast is deeply indented with fiords, at the head of which glaciers come down to the water, and continually give off small bergs.

While protected from the ocean itself, these deep channels are under certain conditions themselves very dangerous. The passages are numerous and intricate, and thick weather, fog and snow, are not only frequent, but general, and almost constant in winter. Rocks are numerous and the tidal currents troublesome. Yet, if properly protected, navigation is not difficult, for the soundings are deep and the shores are bold.

Everything of Rugged Character.

Most of the mountains are high, rough and notched. Nearly all are covered with a dense growth of timber. The hydrographic characteristics form a parallel to the topographical outline. The rugged nature of the rocks and peaks is paralleled by numerous reefs and rocks surrounded by deep water, and the general absence of shoals. Many of the main channels and most of the minor ones have only been roughly examined. Detached boulders from the broken shores and pinnacles of rock are still frequently found unmarked. On the outside coast of British Columbia, off Puget sound and southeastern Alaska, fogs are liable to occur at any time, but are most frequent in July, August and September. Continuous fogs have been recorded lasting from two to ten days.

Smoke from the forest fires along the wooded shores often assumes alarming proportions in July, August and September on Puget sound and Georgia strait, and has extended a considerable distance seaward from Cape Flattery and up into southeastern Alaska. Smoke, combined with fog, makes a serious and almost absolute preventive to navigation under the present conditions. Tides vary from 7.7 ft. at Sitka, on the outer coast, to 14.5 ft. at Wrangell. Tidal currents and currents of all velocities are found on the course to Alaska.

The commerce of these waters for the fiscal year ending June 30, 1907, was as follows: Exports, $13,644,884, excluding gold and silver; imports of $19,536,956. Gold and silver exports amounted to $14,897,925. Salmon is the big item of export in the sum of $9,145,250.

Aids to Navigation.

Such, in brief, are the conditions and the traffic. Now what are the aids to navigation on the route of this traffic to Alaska? The most intricate

channels are marked with buoys and beacons. Generally the waters are too deep for the use of the lead line, varying from 50 to 400 fathoms. At present the navigator has to literally smell his way along, being guided in a fog entirely by his knowledge, and depending absolutely upon the echo of his whistle for his range and upon his reckoning for his location. Hardly a winter passes that one or more ships are not wrecked, and injuries from striking are common. In THE MARINE REVIEW of October, 1910, was a long list of the casualties to ships on the north Pacific coast in the last three months. In THE MARINE REVIEW of July, 1910, was an account of the salving of the Yucatan, and in October, 1910, the salving of the Princess May, which may be cited as two of the most costly wrecks of the past year. Why should this list read as it does? The answer is wholly in out-of-date and inadequate apparatus and methods of protection.

There are in all 22 lights and signals in the waters of southeastern Alaska, according to the latest available information. Seven of these 22 have fog signals, two of which are sirens, one a bell and four trumpets. Only three of them are flashing lights. One at Hog island flashes occasional white every eight seconds; one at Eldred rocks flashes alternately white and red every ten seconds, and one at Green island flashes white every five and one-half seconds. And these are all the aids to the navigator at night or in a fog, found in a distance 300 miles in length, comprising seven large and hundreds of small islands, with countless reefs and a broken shore line totaling thousands of miles. The traffic passing through these waters and the lives of the passengers as well as the crew depend almost entirely upon the intuition of the navigator for their safety. The geodetic survey charts and the light and fog signals are inadequate and incomplete, as well as being improperly provided for.

Conditions Should be Improved.

What is needed is some business-like step to improve matters at once; not to prepare some lengthy report to congress, the mere magnitude of which will cause despair; but something immediate and effective that would answer the purpose at least until the government could establish permanent beacons.

The immediate solution of the situation lies in the installation of the submarine signal bell, which is not affected by atmospheric conditions. Silent zones are common in the coast waters. These silent zones shunt and kill the sound of any apparatus that uses air as a conveying medium. A ship may pass into a silent zone and hear absolutely nothing, though it may be immediately upon a dangerous reef of rock.

There is no trouble in naming 50 stations on the Pacific coast and in Alaskan waters where danger signals are needed, but THE MARINE REVIEW submits the following list of nine stations on the Pacific coast, ten on the Alaskan coast, and 15 on the inside passages of southeastern Alaska, where there is at present no protection or insufficient protection. These stations should be equipped with the submarine bell signal at once. An appropriation of $500,000 would do this. Most especially should the work not be done piece-meal—that is the principal trouble now. It should be taken up as a whole, and a complete, comprehensive system provided.

Submarine Signals are Necessary.

The following points need signals on the Pacific coast of the United States proper:

Point Loma, Cal.; San Pedro, Cal.; Point Deception, Cal.; Alcatraz island, San Francisco harbor; Farallon island; Gray's Harbor, Wash.; Partridge bank, Wash.; and Turn Point, Wash.

On the Alaskan coast we have the Pacific Coast Steamship Co., the Alaska Coast Co., the Coast Steamship Co., and the Alaska Steamship Co., and three smaller companies, operating regular lines through to Bering Sea and northern Alaska. The following points need signals:

Cape Muzon, south end Dall island; Cape Decision, south end Kuiu island; Cape Ommany, Baranoff island; Cape Edgecombe; Cape Spencer; Cape Hinchinbrook; Uganok island, Unimak pass; Priest Rock, Unalaska island; Cape Mohican, Munivak island; Cape Nome, north side Norton sound.

Five steamship companies carrying freight and passengers operate summer and winter through the inside channels and passages formed by a chain of coast islands extending from Puget sound to Lynn channel, a distance of 1,500 miles. The following points in southeastern Alaskan waters need signals:

Tree Point; Guard Island; Ship Island; Clarence Straits; Wrangel Harbor, north end Wrangel island; Strait Island; Point Alexander; Cape Strait; Five Fingers; Yasha Island; Turnabout Island, Frederick sound; Midway Island, Stephen's Passage; Marion Island; Little Island, north of Little Island; Eldred Rock, Lynn channel. Of the 15 points here named in southeastern Alaskan waters, 11 have no protection or equipment of any kind.

Insurance Rates are High.

With the present insufficient aids, the companies operating lines are not inclined to build new or better ships, for a new vessel stands no more show of passing safely through a trip to southeast Alaska than does an old, dangerous hull. One of the reactionary effects of this condition and service is to hinder and prevent the development of Alaska coal. A number of projects under way near Controller bay are now stopped through lack of proper facilities for transportation by water and the fact that the channels are not buoyed or staked.

The lack of protection has reacted on the shipper and caused the insurance underwriters to raise their rates. Generally speaking, cargo rates on business going by the inside passage to Alaska have advanced from ¾ per cent, which was in effect last year, to 1 per cent, while that going outside has gone up from ½ to ¾ per cent. On hulls, various increases have been made, particularly on vessels taking the inside passage.

The following is from Capt. Allen, of the British steamship Henley. Writing from Manzanilla, Mex., on Sept. 26, Capt. Allen says: "Attention is respectfully called to the light and fog signal on Tatoosh island. The writer has frequently rounded that cape in thick weather and when a distance of 2 miles from the lighthouse by dead reckoning, nothing has been seen of the light at night and nothing has been heard of the fog signal either by day or night, although the weather was calm at the time, on several occasions. This dangerous cape is the rounding point to and from all ports, American and Canadian, for all ships coming from and going southward and most vessels from the westward endeavor to make it before proceeding through the Straits of Juan de Fuca. It should, therefore, in the writer's humble opinion, be provided with a powerful light and fog signal."

A Plea for Help.

The following from the Seattle *Daily Times* presents most vividly the conditions: "The crying need of the Pacific coast, especially on Puget sound and in Alaskan waters, for aids to navigation, has been brought home

during the last few months through the unusually large number of wrecks in this section and in the north. That the wrecks have not been attended with a horrible loss of life which has marked several of the past years is due largely to luck and not to general conditions. The recent mishap to the Watson, on Waddah island, points to the need of a competent fog signal at that point. Capt. J. Griffith, of the Watson, said, 'There should be at least a fog signal and, if possible, a vertical ray or other light to warn navigators of the island's position.'

"Comparing the situation on this coast with that on the Atlantic, the pitiful supply of aids for the much rockier shore line here is most noticeable. On the great lakes, even, the shipping men fare far better than those of this coast, for on Lake Superior alone are 33 lighthouses and seven life-saving stations, and on Lake Michigan 50 lighthouses and 20 life-saving stations. Either one of these lakes has more protection than the entire coast of Alaska, over 3,000 miles in length."

With the recent establishment of the new Alaska lighthouse district, the sixteenth, under the control of Com. E. H. Tillman, radical changes should be instituted and an attempt made to provide the protection necessary for the Pacific coast waters from Puget sound to southeastern Alaska.

The German Ship Yards

FOR some weeks the men in the German ship yards have been out of work, either because they have been on strike, or for the reason that they have been locked out. At this present date there is no telling which way the cat will jump—or whether it will jump at all within the next few days. It goes without saying that this condition of affairs is attended with great loss to the ship yard proprietors. Foreign yards are reaping in part the benefit of the status, as every day one reads that such and such an order for building and repairing—especially the latter—has been placed in foreign hands. In view of the seriousness of matters in this connection it is interesting to consider the magnitude of the interests involved. The Dresdener Anzeiger has made a tabulation of statistics concerning the principal German yards, in which it is seen that these are 31 in number, covering a total of 12,139,740 square meters or about 3,000 acres. Of these 7,850,000 square meters or 1,940 acres are taken up by the Imperial ship works. The greatest of the private works, those of Schichau in Elbing, Danzig and Pillau, cover in all 212.5 acres. Next in order of area are those of the Vulkan Works in Stettin and Hamburg, with 126 acres, and Blohm & Voss in Hamburg with 113.6 acres. The next in importance are those of the Aktiengesellschaft Weser in Bremen with 99 acres, then the Bremer Vulkan Works in Vegesack, 74.1 acres; the Germania Werft of the Krupp concern in Gaarden near Kiel, 58 acres; Johann C. Tecklenborg in Geestemuende and the Nordseewerft in Emden, 49.4 acres; the Flensburger Schiffbaugesellschaft in Flensburg, 45 acres; the Howaldt Werke in Kiel, 32.9 acres; the Stettiner Oderwerke with 4.4 acres, and the Neptunwerke in Dostock with 26.1 acres. The other yards in Hamburg have a combined area of only 24.7 acres. Of these may be mentioned the Reiherstieg Schiffswerfe & Machinenfabrik with 12 acres; H. C. Stuelken Soehne with 4.4 acres; J. N. N. Wichhorse with 3.95 acres; H. Brandenburg, 3.4 acres, and Janssen & Schmielinsky, 0.22 acre.

Of ways there are in German ship yards 105 of 328 ft. long, 38 of lengths up to 492 ft., 19 up to 656 ft., and 15 over that length. Adding the five ways of the Imperial yards, there is a total of 182 berths for ships. Of 25, 21 are private and four governmental. The various yards have 73 docks, of which 16 dry docks are private. Five of these are less than 328 ft. long, the rest over that length. There are 34 private floating docks, of which 31 are less than 328 ft. long, 8 up to 492 ft. and 5 over this latter length. The greatest number of docks is owned by the firm of Blohm & Voss.

As regards workmen, the Imperial yards employ 23,000, the Vulkan yards 8,800, F. Schichau 7,100, Blohm & Voss 5,100, the Aktiengsellschaft Weser 4,230, the Germaniawerft in Kiel-Gaarden 3,500, Techlenborg in Geestemuende 2,620, the Howaldt Works 2,350, the Flensburger Schiffbaugesellschaft 1,500, the Reiher-Stieg-Schiffswerfte 1,410, the Bremer Vulkan 1,270, the Neptunwerft 1,290, and Seeback in Geestemuende (not mentioned in the previous part of the tabulation) 1,100. Of the Hamburg establishments just mentioned, H. Stuelcken & Soehne employ 450 men, H. Brandenburg 480, Wichhorst 280 and Janssen & Schmielinsky 210. In all, there are 63,430 persons employed in the German ship yards above enumerated.

Development of the Gas Engine

In the report for the year on the operations of Lloyds register of British and foreign shipping, just issued, an important statement appears under "Rules for Internal Combustion Engines." The use for internal combustion engines for marine purposes has hitherto been confined to small vessels and yachts, but now, says Lloyds, the possibility of the use of this description of engine as the motive power of large vessels is becoming a question of immediate and practical importance. The internal combustion engines in most general use on land and also those fitted in small vessels are worked on the four-stroke cycle principle, and are single-acting, so that with each cylinder there is only one impulse for two revolutions of the shaft. With this type of engine, there is considerable difficulty in effecting the reversal of the direction of rotation of the engine, and when these engines are used for marine purposes, the astern motion of the screw has usually been obtained by the use of toothed wheel gearing. Comparatively recently there has been a development in the Diesel oil engine for marine work. A two-stroke cycle has been successfully adopted, and the reversal is effected in the engine itself, the crank shaft being directly coupled to the screw shaft. The Diesel oil engine is now being fitted to three fairly large vessels being built on the continent under the supervision of the surveyors to Lloyds register. In a set of internal combustion engines which is being constructed under the society's survey in Britain for a vessel of about 260 tons, there are several novel features. The engines are intended to work with gas produced on board from anthracite coal. The cylinders are of comparatively small size, and the engines are intended to run at a high rate of revolution, and will not be reversible. The connection with the screw shaft will be made by means of a hydro-dynamic transformer in which a turbine pump driven by the engines delivers water to another turbine coupled directly to the screw shaft. The arrangement is such that the screw shaft will rotate at a much less rate of speed than the engines, and provision is also made for reversing its direction of rotation.

HOW THE MEYER SYSTEM OF NAVY YARD ORGANIZATION WORKS

Only a few examples are given of the inefficiency of the present organization. The writer has made a personal investigation and has himself seen these and many others even worse. It is well known that the navy department will punish any one who dares to speak the truth about the present organization. It has even gone so far as to punish prominent officials who, in the course of their duty, have given information to the naval committee. If the writer should tell all he knows, those innocent of any wrong would be marked for punishment. If congress will really investigate, abundant evidence to establish the charge of naval inefficiency will be forthcoming.

ALMOST a year has elapsed since the organization devised for the navy department by Secretary Meyer and his aides went into effect. The time has now arrived when it is possible to judge clearly the merits and demerits of Mr. Meyer's system of organization, to note its effect upon the efficiency and effectiveness of the navy and its value in procuring economy in naval administration. The author has recently had the opportunity of visiting several navy yards at some length, and of examining carefully and thoroughly their condition and administration under the Meyer regime. This article proposes to relate frankly the results of this investigation, showing the actual workings of the Meyer system as it affects the navy yards. The author is an engineer by training and experience and is competent to criticize engineering matters and affairs pertaining to works management.

At the time the Meyer "re-organization" took effect, it was announced that the new scheme would promote harmony, simplicity, efficiency and the utmost economy. It was announced that the Newberry system of consolidation had failed in all these particulars. As a matter of fact, in the few yards where the Newberry system had full swing and during the very short time it was in operation, some startling results were obtained in the reduction of the cost of doing work. How has the Meyer scheme fared in this respect?

Meyer System Results in Friction.

After a careful study of the situation the author has come to the conclusion that the Meyer system of naval organization has resulted in friction, wastefulness, extravagance, useless duplication of machines, materials and organizations, conflict of authority and dangerous division of responsibility. The system is without a counterpart in any industrial organization; it is clumsy, crude, illogical and unbusinesslike. These contentions the author will prove in the course of this article.

Friction between officers, between departments and between superiors and their subordinates has developed—in some cases to an alarming degree—because the officers who actually know the *least* about yard administration and the extremely technical matters constantly arising for consideration and adjustment, are placed in authority over the officers who really know the most about these matters. The supreme authority is rested in line officers whose experience has been almost entirely at sea, and who know nothing of shops, engineering, organization or works management, while the construction officers, whose training specially fits them for yard management, are placed in subordinate positions. This is a reversal of the natural order of things, and places the commandant in a false position. Friction is only the natural result, and friction has developed, as might have been expected, to the great detriment of the efficiency of the service. It has been urged that the commandant of a navy yard occupies a position comparable with that of president in a commercial organization and that technical skill on his part is therefore unnecessary. This might be all right if it were true, but in actual practice the commandant under the Meyer scheme is the actual manager of the yard and all the technical details pass through his hands. With this in mind, the folly of placing a line officer in this position is self evident. The subordinant officers are allowed practically no freedom of action, which only increases the friction all along the line; the ropes are drawn so tightly that no communications are permitted between heads of departments without going through the commandant's office. Frequently the written orders of a superior are revoked to his subordinate verbally, after the superior learns how little he himself knows about the matter.

Sample of Idiotic Orders.

Below are samples of the idiotic orders which emanate from the headquarters of the department at Washington. A navy yard was requested recently to furnish "a payroll of indirect charges." The entire cost system in vogue in the various yards was recently suddenly and radically changed by a letter from Washington. A few days later a new order was received, only to be immediately modified by telegraph. In five weeks five important modifications were made in the cost keeping system. Owing to the divided responsibility and lack of ability in many directions, the writer found that in some yards under present circumstances, one division or department would be up to date in its work and another all the way from one to three months behind.

Waste, extravagance, useless duplication, conflict of authority and division of responsibility are only a natural result of the system now in vogue. The Newberry system was unified, compact and concentrated; the actual workings of the Meyer system show it to be scattered, inharmonious and hardly worthy of the names of organization. Instead of one organization with centralized, intelligent authority, each navy yard consists nominally of three great departments, a hull division, a machinery division and a department of yards and docks. The line of demarcation between these departments can be only vaguely defined; the departments are at once independent in authority and inter-dependent in their work. These are the two great, irremediable faults which are inherent in the system itself, and which can be eliminated only by eradicating the entire organization root and branch. The following incidents illustrate a few of the follies growing out of this system of having several independent departments working on the same job.

Interminable Red Tape.

The hull division needed the use of a locomotive crane alongside a ship at dock. Permission to use the crane had to be formally asked in writing of the bureau of yards and docks, and it developed that the crane was broken and in need of repairs. The bureau of yards and docks had made no effort to have the crane repaired of its own initiative so that it might be ready. The civil engineer was called in to inspect the crane and report to the captain of the yard, head of the department of yards and docks, its condition. He reported certain minor repairs necessary requiring some machine shop work. A formal order to

do the work was then presented to the machinery division. When the machine work was done it was presented to the civil engineer, who in his turn reassembled the machinery and reported again to the captain of the yard in writing. Finally, the crane was ready at the end of ten days, and one day had been necessary for the actual work of repairing. Meanwhile the ship needing the services of the crane, waited.

To obtain permission to work at night on a rush job in dry dock, it is necessary to first get the written authority of the commandant and to then write three letters to each of the three departments concerned.

The essentials of the Meyer system are embodied in an official circular called "Changes in Navy Regulation No. 6," dated at Washington, Nov. 18, 1909. Below is paragraph No. 1566 of this circular, which indicates very clearly the duplication of facilities and also the fact that the machinery division is made self-contained, whereas the hull division is dependent upon the machinery division for assistance in executing 40 per cent of its work. The duplicated facilities are in italics.

"1566. (1) At navy yards other than at Washington, there shall be two divisions of the manufacturing department—the machinery division and the hull division; and all labor in the navy yard, except that of the medical department, of the general storekeeper, and of the provisions and clothing depot, shall be distributed between these two divisions as the commandant may direct.

"(2) The shops and manufacturing and repairing facilities at a navy yard, except those for the preparation or manufacture of provisions or clothing, shall be assigned to the machinery and hull division, as follows:

"Machinery Division.

Blacksmiths' shop (machine).
Boiler shop.
Coppersmiths' shop.
Machine shop.
Pipefitters' shop.
Tool makers' shop.
Instrument makers' shop.
Electrical shop.
Foundry.
Pattern shop.
Anchor shop.
Chain shop.
Power station and plants.
Boiler plants and sub-stations.
Operating machinery of mechanical coaling plants.

Hull Division.

Sawmill.
Shipwrights' shop.
Spar shop.
Boat shop.
Mold loft.
Block shop.
Carpenters' and joiners' shop.
Upholstering and leather working shop.
Blacksmiths' shop (hull).
Plumbers' shop.
Pipefitters' shop.
Galvanizing and electroplating shop."

In one yard the writer saw quantities of light sheet metal work being done in a *boiler shop* with a nearby sheet metal shop working at half capacity. Upon inquiring the reason it was found that the two shops belonged to different divisions and did not cooperate. Another shop went to considerable expense in procuring and preparing material for an important job, and then discovered after a few hundred dollars had been spent, that there was no tool large enough to work the material. At another point four men were seen laboriously dragging heavy pillow block caps about by main strength, while two cranes lay idle within 100 ft. But the cranes belonged to another department, and to get permission to use them would take a day's time.

Central tool grinding stations, systematic routing of work through the machine shops, and other money and time-saving features found in every even moderately well-appointed commercial shop today, cannot exist at the navy yards under the Meyer system.

Men Loitering About the Shops.

Another feature in the Meyer system productive of waste is the fact that the sailors aboard ship are supposed to co-operate with the yard in making certain minor repairs, the result being that enlisted men are continually loitering about the shops, interfering with the work, borrowing tools and taking up the time of workmen and foremen.

If a pipefitter in the hull department wants a pipe cut for a certain purpose, or special threads cut requiring machine work, it is necessary for the construction officer to write a letter about the matter to the head of the machinery division, who in turn issues the order to his shop foreman. The actual work to be done might not take over 10 minutes.

In some cases where a worm gear is used, one department is responsible for the worm and another department for the wheel, while neither is obligated to see that the two parts are a mutual fit. Yet this is one machine paid for by one appropriation. Such is the Meyer organization!

Examples of Divided Responsibility.

A few more examples of the division of responsibility between the hull and machinery departments are of interest. In a torpedo outfit the hull division builds the foundations and installs the mouthpieces and sluice gates for the tubes; the machinery division places the tubes, which are then drilled and secured by the hull division. The machinery division installs the motors, controllers and pinions on motor shafts in boat cranes, while the rest of the work goes to the hull division. In the case of deck winches, the hull division builds the foundations and drills holes and then the winches are provided, lined up, placed and secured by the machinery division. The same is true of anchor winches. Devices for filling fuel oil tanks are fitted by the hull division; indicators for the tanks are provided by the machinery division, but are installed, except electrical connections, by the hull division. The machinery division provides the steering engine, places, couples and secures it, the balance of the work connected with its installation being assigned to the hull division. The hull division is responsible for the fresh water system on a ship, except that power pumps are provided, placed and secured by the machinery division. In the case of ventilating, refrigerating or heating apparatus, the hull division builds the foundations for fans and builds all trunks and ducts; the hull division also installs all piping for steam heating outside of the engine and boiler rooms; in the engine and boiler rooms this same piping is installed by the machinery division, which also provides and installs fans, motors and controllers and all refrigerating machinery, including piping up to the cold storage rooms. Piping in the cold storage rooms, however, is installed by the hull division. It will be remembered that the hull and machinery divisions are independent, co-ordinate departments and that neither is answerable to the other. A better device to divide responsibility, delay work, create expense and introduce errors could not have been invented than this system devised by Mr. Meyer to apportion naval repairs between the two great departments into which he has divided our navy yards.

Arbitrarily Dividing Work.

When a ship comes to a yard for routine repairs, the captain makes a report to the commandant of the yard, giving a list of the repairs desired. Then the work is parceled out between the hull and machinery division, leaving, of course, a few gaps to be filled later. The two departments concerned then independently commence work. While this red tape is unwinding the ship lies waiting, probably eight or 10 days. The hull division usually does 60 per cent of the work, 40 per cent of which requires

SHIP_____

REPAIRS AND

Date of request_____

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machine work, and in order to get this machine work done, formal request must be made to the machinery division for each item. The folly of thus arbitrarily dividing work which is naturally a unit, between two artificial hull and machinery departments would be apparent to anyone but a naval officer.

Instances of this useless division of responsibility might be continued indefinitely. A few more only, however, will be cited. In installing a pipe line carrying steam for cookers in the galley, the pipe is laid by the hull division and the valves in the same line by the machinery division. The "Changes in Naval Regulations," referred to above, state in one place: "The Bureau of Ordnance shall design, construct and determine the requirements of all ammunition hoists," and in another place, "The Bureau of Construction shall have cognizance of all electric turret-turning machinery and of all electrically-operated ammunition hoists *except* turret hoists." This is a fair sample of the consistency of naval regulations and of the indefinite mass of conflicting regulations upon which the Meyer system is founded.

In order to further mix matters, the captain of the yard, who has a large amount of work to do, keeps no labor roll, but draws his men as he wishes from the machinery or hull departments and turns them back to these departments when he is through with them. The confusion, waste and trouble this arrangement causes may be easily imagined.

A Plethora of Officers.

Of course, all this duplication of facilities and division of responsibility requires more officers. *Twenty-two additional officers* were recently ordered to duty at one prominent yard, adding to the payroll chargeable to this yard over $75,000 per year without one whit more work being done. Meanwhile constant requests are made to congress for more officers for the fleet.

The Meyer system is gradually breaking down of its own weight. Probably its worst feature is that all incentive to economy, achievement and progress has been completely crushed out of the ambitious officers and workmen. There is no system or order prevailing, and nothing left to strive for; all efforts toward progress are promptly crushed. Even numberless line officers for whose sole benefit the Meyer system was established, have become disgusted. One who was sent to a navy yard could not stand it, and asked to be again sent to sea. Another line officer after several weeks on duty at a navy yard, asserts he is ready to submit a written report that the present system is a failure, and can never be made to work. It appears that the Meyer organization is so crude that it has over-reached itself, so that even its friends and those whom it was designed to benefit are turning against it.

There is on file in this office a letter from a naval officer, in which he says:

"The explosion on the North Dakota is what one expects under the present condition. I know of but one accident on an oil burner, and that was when the ship was under repair, and was due to a rotten installation in an old ship and the oil leaked all over the ship. I think that it was on the Dispatch in San Francisco. In the North Dakota every precaution was taken in the installation—far more so than on a merchant ship, and it should be almost fool proof. As you know there is no danger of oil under ordinary working conditions, but if we are to have line officers as engineers we can expect anything. *Mark my words,* We shall some day and perhaps soon, have some accidents that will startle the world. I see by the papers that engineering conditions on the battleship Indiana are rotten, and that a court martial of the engineer officer will result. They can't convict anybody. It is the Navy way. No one is responsible."

The Newberry Naval Reorganization Plan

EDITOR MARINE REVIEW:—Sir: To Mr. Truman H. Newberry must be given the credit for initiating reform in our naval establishments on shore. Doubtless he would have achieved wonderful results in economy and efficiency had he been permitted to remain as secretary of the navy, for he brought to his task wide experience as a manufacturer, intimate knowledge of naval matters and naval men, based upon an exceptionally long term of service in the navy department, and unusual moral courage. His predecessors had written long and elaborate reports on the need of change in both organization and administration which were *brutum fulmen,* but he, knowing exactly what to do, proceeded to act. His successor found this important question raised so definitely that but two courses were open to him—either to return things to their former condition or to push ahead along the path Mr. Newberry had blazed. He chose the latter. Unfortunately he was not content with giving Mr. Newberry's scheme a fair trial but almost immediately proceeded to make important departures without possessing personal acquaintance with the intricate naval organism. It may safely be asserted that without Mr. Newberry's forceful and self-reliant action naval reform would have continued a subject of discussion as something desirable but impracticable of attainment and that pretty much all of good which Mr. Meyer will achieve will be due to the preparation of the field by Mr. Newberry.

Modifications of the Plan.

It may serve a useful purpose to contrast the plan as originally laid out and as it now exists after modification. In one respect no difference is to be perceived. The bureau of equipment is eliminated by both. Whether it is a wise move or not is far from settlement. It would indeed seem preferable, from the seagoing officers' standpoint, to recognize the unavoidable distinction between the four principal departments represented by the building of the hull and its fittings, the building of the engines, etc., the construction and mounting of the battery and the providing of the innumerable articles of equipment, without which a ship is helpless. To burden the great manufacturing branches with the furnishing of corn brooms, holystones, awnings, bedsteads, mattresses, cooking utensils, hawsers, etc., is, some competent critics believe, a mistake. However, the thing has been done and the future will alone show that it was judiciously done.

This ultimate abolition of the bureau of equipment was practically the only fundamental change in the navy department itself contemplated by Mr. Newberry. He altered in some ways the existing machinery as, for instance, in a recomposition of the board of construction, giving it an overwhelming majority of line officers, appreciating, as he did, the necessity of fresh and interested representation from the fleet and in taking steps to get up an accounting

system by which accurate returns could be had of the actual cost of work. He perceived that the navy yard is merely a hand maiden to the battle ship and he believed that rapidity and economy of work could best be secured through placing all manufacture there under one superintendent acting by orders of the commandant. At one stroke he abolished five independent plants at a yard, each in some cases maintaining a full equipment of similar general shops, besides the possible one or two peculiar to its own needs and he concentrated them all in one as the charge of the manager of the manufacturing department. This was a fatal blow to the pernicious extension of the so called "Bureau System." The business of the navy department, as will be remembered, is by law divided among eight bureaus with only five of which he was concerned in this instance, viz.: construction and repair; steam engineering; ordnance; equipment; yards and docks, for these were the bureaus which, from small beginnings, had gradually built up separate industrial establishments at each yard, covering much the same ground. The consequent multiplication of tools and administrative staff was both wasteful and indefensible, and at Mr. Newberry's command, its unholy career came to an end.

Newberry's Division of the Manufacturing Department.

Mr. Meyer has divided the manufacturing department at the yards into two great divisions, hull and engines. Much may be said in favor of this measure, although it will never be possible to compare the actual working of the Newberry and the Meyer plans because the former was denied an opportunity to demonstrate its value. It offered one apparent advantage not possessed by the latter. Through continuity of employment the naval constructors, a shore-keeping set of officers, from among whom all managers of the manufacturing departments were drawn, would probably have become, eventually, fairly good shop managers. The sea-going officer, now head of the engine division for a relatively brief term of service, lacks the opportunity and may possibly fail therefore to reach the highest plane of efficiency. The cost accounting ought to determine this difference and, incidentally, set up a healthy rivalry between the hull and the engine divisions.

This move on Mr. Meyer's part is based on the assumed analogy between private ship yards and navy yards. It ignores the fact that, in the former, the central control is located in the yard itself and it re-establishes that of the bureaus, destroyed by Mr. Newberry. In the one case the main office is close at hand to supervise and direct both branches, making them work together for the common good, in the other the actual chiefs are remotely placed in Washington. Time alone will show the wisdom of this departure from Mr. Newberry's plan.

Mr. Meyer has also reinvested the management of its affairs at the yards in the bureau of yards and docks (civil engineering). Since the civil engineers had exhibited an almost unbroken record of extravagance and inefficiency, the justification for this move is less apparent.

A Probably Fruitful Change.

In the department itself, Mr. Meyer has made one radical change which promises to be fruitful of benefit. He has formed four great divisions, operation (of the fleet), material, personnel, and inspection. At the head of each is an aide, a naval officer of his selection whose province is to keep the secretary informed on subjects pertinent to his division and to recommend appropriate action when necessary. The division of operation concerns the employment of vessels, war plans, qualities and attributes of ships to be built and the general direction of the squadrons in time of war. It includes the war college, the general board and the office of naval intelligence. That of material embraces the bureaus of construction and repair, steam engineering, ordnance, supplies, and accounts. That of personnel takes in the bureaus of navigation and the medicine and surgery. That of inspection corresponds to the inspector general's place in the army. It fills a long-felt want as the essence of efficient administration is frequent and unexpected scrutiny. While opinions may differ as to whether the advantages to be derived from, say, the bringing together of the four manufacturing and providing bureaus under one control may not be outweighed by the inevitable delay and red tape it occasions, no one can justly challenge the desirability of a remorseless inspecting board empowered to inquire into anything and everything. As to the former an earnest effort to push the work along and not to consume time in needless references and cross references may succeed in removing the doubts that still exist in certain quarters, but if the labors of the division of material are undertaken in any other spirit, notably in a desire to magnify the office at the expense of accumulating papers and hampering the legitimate activities of the bureaus within it, ultimate breakdown is inevitable. Therein lies the danger which only broad-minded action combining force and prudence can avail to escape.

You will, of course, perceive that the time is inopportune for a disclosure of the writer's identity and I therefore beg to subscribe myself,

Very respectfully,

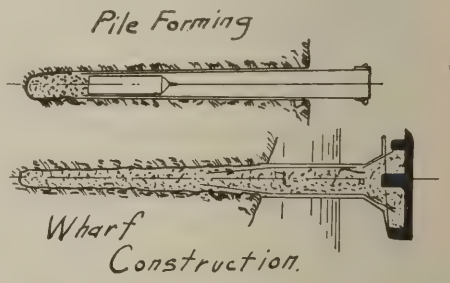
CONNING TOWER.

A New Concrete Pile

BY J. M. WRIGHT.

Improvements in the various types of concrete piles, and their accompanying driving and casting apparatus, have been noted from time to time. Many cities of the United States are now requiring that concrete wharves be built to replace the old wooden ones that are fast going into disuse. The combined efforts of the physical, animal and vegetable world have no effect upon concrete construction, and it is well to note the great advances in concrete appliances peculiar to water-front uses.

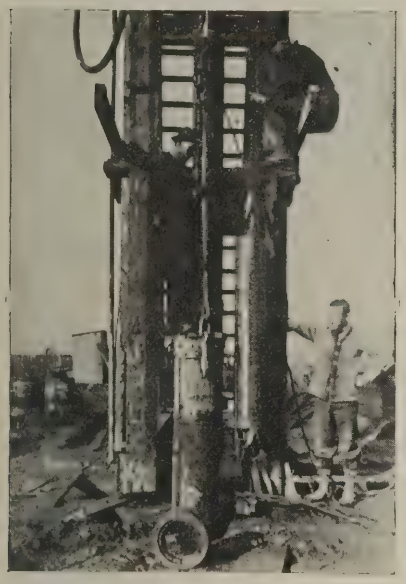
With the old wooden pile and the



"ready made" concrete pile the problem has been largely one of getting a bearing on bed rock, and using the foot of the pile and its supporting substance to uphold the entire load. With the advent of the concrete pile "cast in place" the problem has become one of securing an intimate relation between the wet concrete and the surrounding earth, so that the concrete after hardening may become as nearly as possible a part of the earth itself. This is desirable in that it decreases the load to be borne by the earth immediately at the foot of the pile, and increases the skin "friction," thereby distributing the load along the entire length of the pile. If the pile has a tapering body there is an added advantage on account of the in-

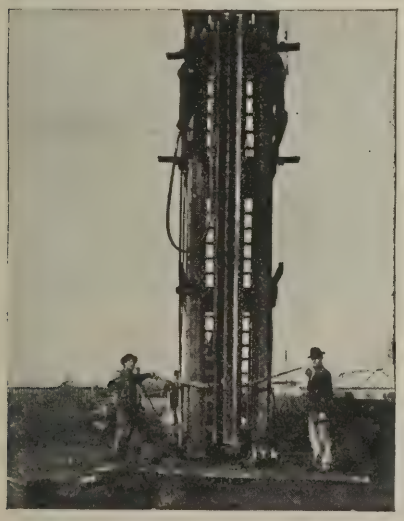
creased support given the pile throughout its entire length.

There is a third advantage in casting the pile in place. With both wooden and "ready made" concrete piles there remained considerable material above the ground to be removed after the pile had been driven to its entire



DEPOSITING BUCKET, JUST RAISED FROM BOTTOM OF SHELL.

depth. The removal of this material was expensive from the standpoint of wasted material, labor involved and loss of time. This expense has been done away with by simply stopping the formation of the pile when the proper grade has been reached.



SHELL OPEN AND CORE REMOVED.

An improved type of concrete pile and "former" has been designed by the Portland Concrete Pile & Equipment Co., of Portland, Ore., and is shown in the accompanying figures. The "former" consists of a structural steel core incased in two semi-circular steel shells hinged together on their side, and having an opening on the opposite side, covered by a closure plate.

The pile former is driven into the earth by a steam hammer, or other method of pile driving, to a depth to conform with the architect's plans and specifications. The core is withdrawn as the hammer is hoisted, being directly secured to the hammer. After being raised sufficiently to clear the "former" a quantity of wet concrete is deposited in the shell by means of a bottom dump bucket. The shell is then withdrawn for a short distance and the concrete thoroughly rammed into the surrounding earth. A second bucket of concrete is introduced, the shell is drawn a short distance and the concrete is again rammed. This operation is repeated until the shell is entirely withdrawn and the pile is completed.

The earth surrounding each pile has been compressed by the driving of the tapering former. As the concrete has been thoroughly rammed, this pile cements itself to the surrounding earth, increasing the skin friction to a maximum and distributing the load along the entire length of the pile.

As described in THE MARINE REVIEW of July, 1910, San Francisco has made the first step on the Pacific coast toward permanent wharf construction in the completion of the concrete piers 38 and 40 at the foot of First street. Other cities on the Pacific coast are now considering the erection of concrete piers. First among these is Portland, Ore., where tentative plans have been drawn for a number of permanent concrete wharves under the direction of the port of Portland.

Pacific Coast News

THE first submarine signal bells to be installed on coastwise merchant vessels were tried out recently on the steamship President, of the Pacific Coast Steamship Co., under the command of Capt. H. C. Thomas. Capt. Thomas states he was able to catch the signals from Umitalla reef at a distance of about seven miles. The government, some time since, equipped a number of lightships and signal stations with submarine bells, but the merchant vessels are just realizing their value. The submarine bell will do much to prevent the numerous casualties on Puget Sound due to fog and silent zones.

The Marine and Fisheries department of the Dominion of Canada has announced the following aids to navigation that will be established in British Columbia waters: Gas beacon on Mary Ann Point, Active Pass; gas beacon for Camp Point or Helmcken Island, Johnson Strait; acetylene light on 13-foot rock off Crane Islands; white beacon on point of Denny Island, opposite Serpent Point, Lama Passage; gas beacon and bell on Camp Island, Lama Passage; beacon on north extreme of White Cliff Island, Arthur Passage; lighthouse and fog signal marking Holland Island, outside Prince Rupert harbor; beacon and bell buoy at Spire ledge, Prince Rupert harbor; gas beacon on Low Islands, at entrance to Selwyn inlet, Queen Charlotte Islands.

Capt. T. H. Alcock, who was appointed master at Prince Rupert harbor on that port being proclaimed a public harbor, has taken up his work. The limits defined for the northern harbor include all waters east of a line drawn from Ryan Point to Enfield Rock, thence south to Kinahan Islands and then southeast to Lulu Island.

Capt. Emil Francke, superintendent of the Pacific Coast Steamship Co., one of the most experienced shipping men on Puget Sound, has resigned. E. L. McNoble, chief stevedore, at San Francisco, has been appointed to succeed Capt. Francke at Seattle. Mr. Noble is well known, having been for years pilot and master for the California Transportation Co., and recently assistant to Capt. I. N. Hibberd, the San Francisco superintendent.

The steamer Princess Adelaide, built for the Canadian Pacific Railway Co., for service between Vancouver and Victoria, B. C., will arrive on Puget Sound about the first of December. She was built at the Fairfield Shipbuilding & Engineering Co., on the Clyde, and is being brought out by way of Vincent, Montevideo and Coronel. On her trial trip she made 18.25 knots, the contract speed being 17 knots. She is a single-screw steamer, 290 ft. long, 46-ft. beam, and 17 ft. deep, built of steel throughout with cellular double bottom and seven transverse bulkheads. The steamer is fitted with 118 staterooms, and will have a grill room and restaurant in addition to the regular dining room. The social halls are finished in mahogany and the dining room in walnut. The propelling engine is of triple expansion type, developing about 4,000 horsepower. Steam is supplied with four boilers, each 15 ft. 3 in. diameter and 12 ft. long, equipped with Howden's

forced draft and built to carry 180 lbs. steam pressure.

The fast steamer H. B. Kennedy, built by the Willamette Iron & Steel Works, Portland, and operated by the Puget Sound Navigation Co. between Seattle and Bremerton, Wash., recently made a remarkable speed run over the government measured mile.

With one of her two boilers in use, the Kennedy is reported to have made 15.88 knots per hour and with two boilers 17.5 knots. On an unofficial trial several weeks ago the Kennedy is said to have made 20.83 miles with 300 people on board. The Kennedy is equipped with Ballin water tube boilers, built by the Ballin Water Tube Boiler Co., Portland, Ore.

The H. B. Kennedy is said to be the fastest passenger steamer on Puget Sound. The Puget Sound Navigation Co. will soon let contract for a fast day steamer to operate between Seattle and Tacoma. The new steamer will be over 200 ft. long and will have a sustained sea speed of 18 knots. The city of Tacoma will vote on the authorization of a new municipal dock on Oct. 29, and the Puget Sound Navigation Co. agrees to have the new steamer in operation within seven months after the city authorizes the dock.

The Princess May, which was recently saved from Sentinel Island, Alaska, where she was wrecked, is being fitted to use oil fuel while being repaired by the British Columbia Marine Railway Co., Victoria, B. C. At the present low price of oil on the Pacific coast, it is estimated that the saving effected by the use of oil is from 40 to 60 per cent.

LAUNCHING THE WILLIAM P. PALMER

THE bulk freighter William P. Palmer, the first steamer to be built on the Isherwood or longitudinal system on the great lakes, was successfully launched at the Ecorse yard of the Great Lakes Engineering Works on Oct. 15. This steamer is building for the Pittsburg Steamship Co., and is named in honor of William P. Palmer, president of the American Steel & Wire Co. She was christened by Mr. Palmer's six-year old daughter, Jane, one of the youngest sponsors that ever christened a ship on the lakes. The launching was witnessed by about 1,000 persons who were taken to the ship yard on the steamer Promise.

The event obviously attracted more than usual attention among vessel owners and architects and the opinion among them was practically unanimous that a better built ship does not exist on the lakes. In fact, at the luncheon at the Hotel Pontchartrain which was tendered to the guests by the ship building company after the launching, Mr. Harry Coulby, president and general manager of the Pittsburg Steamship Co., stated that she was the finest ship in his judgment that had ever been built on the lakes, that he had gone over her in great detail and that he had never seen better workmanship. He added that the Palmer represented a new type of construction on the lakes and he hoped that all expectations would be realized. He also expressed the great personal pleasure he felt in naming the ship after Mr. Palmer.

MISS JANE PALMER, THE SPONSOR.

Mr. Palmer in replying said that he was deeply sensible of the honor of having such a splendid steamer named after him.

President Pessano of the Great Lakes Engineering Works expressed his gratification at the smooth way in which everything had worked at the yard, was immensely pleased at the compliments which had been showered upon the ship, and expressed his belief that the new type would mark an advent in the construction of lake vessels. He predicted that the Palmer would carry a greater load than her sister ship, the W. B. Dickson, which was launched at the yard in

Remarkable Photographic Record of the Palmer's Launching

FIRST.

SECOND.

THIRD.

FOURTH.

FIFTH.

SIXTH.

SEVENTH.

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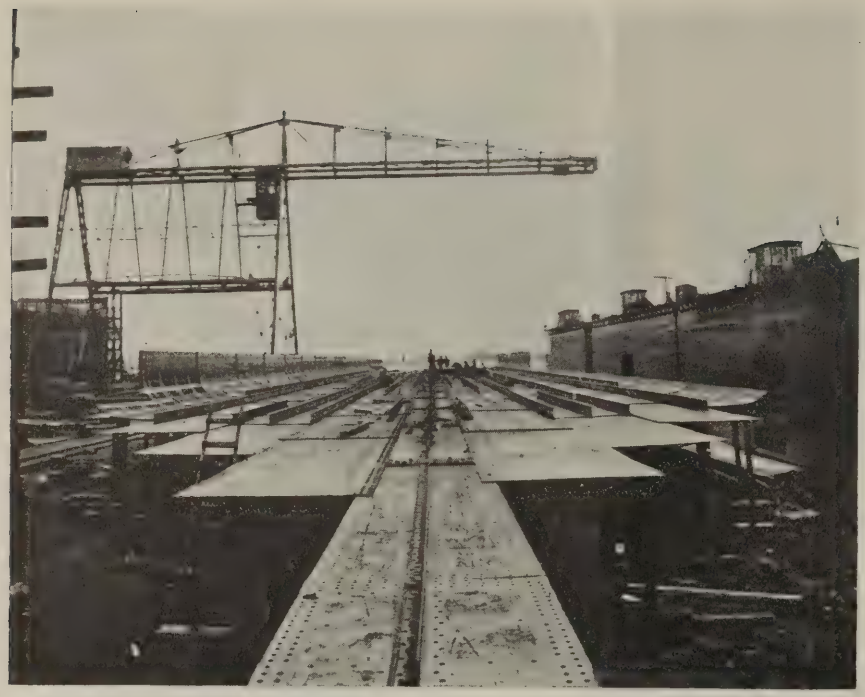


LOOKING FORWARD, MAY 28.

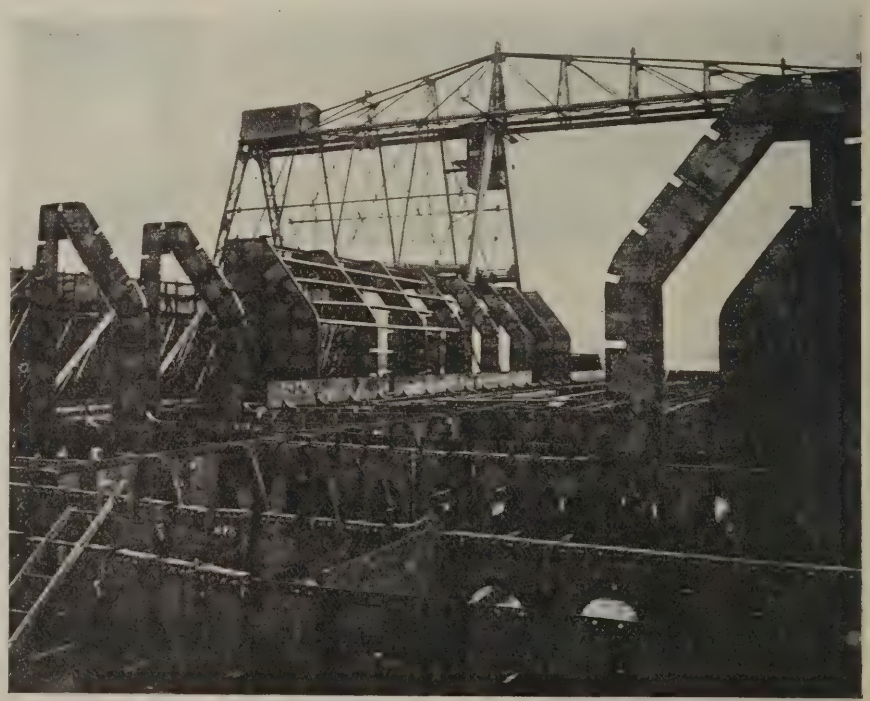
August. In fact, the latest report from the yard was that with machinery and all other weights aboard, the displacement of the Palmer is 500 tons less than that of the Dickson, which would of course indicate that she should carry 500 tons more cargo.

Hermon A. Kelley, general counsel for the Pittsburg Steamship Co., spoke of the moral influence exerted by the United States Steel Corporation and regarded its organization as a natural blessing in that it has never taken advantage of a competitor and is anxious to see that everyone gets a square deal.

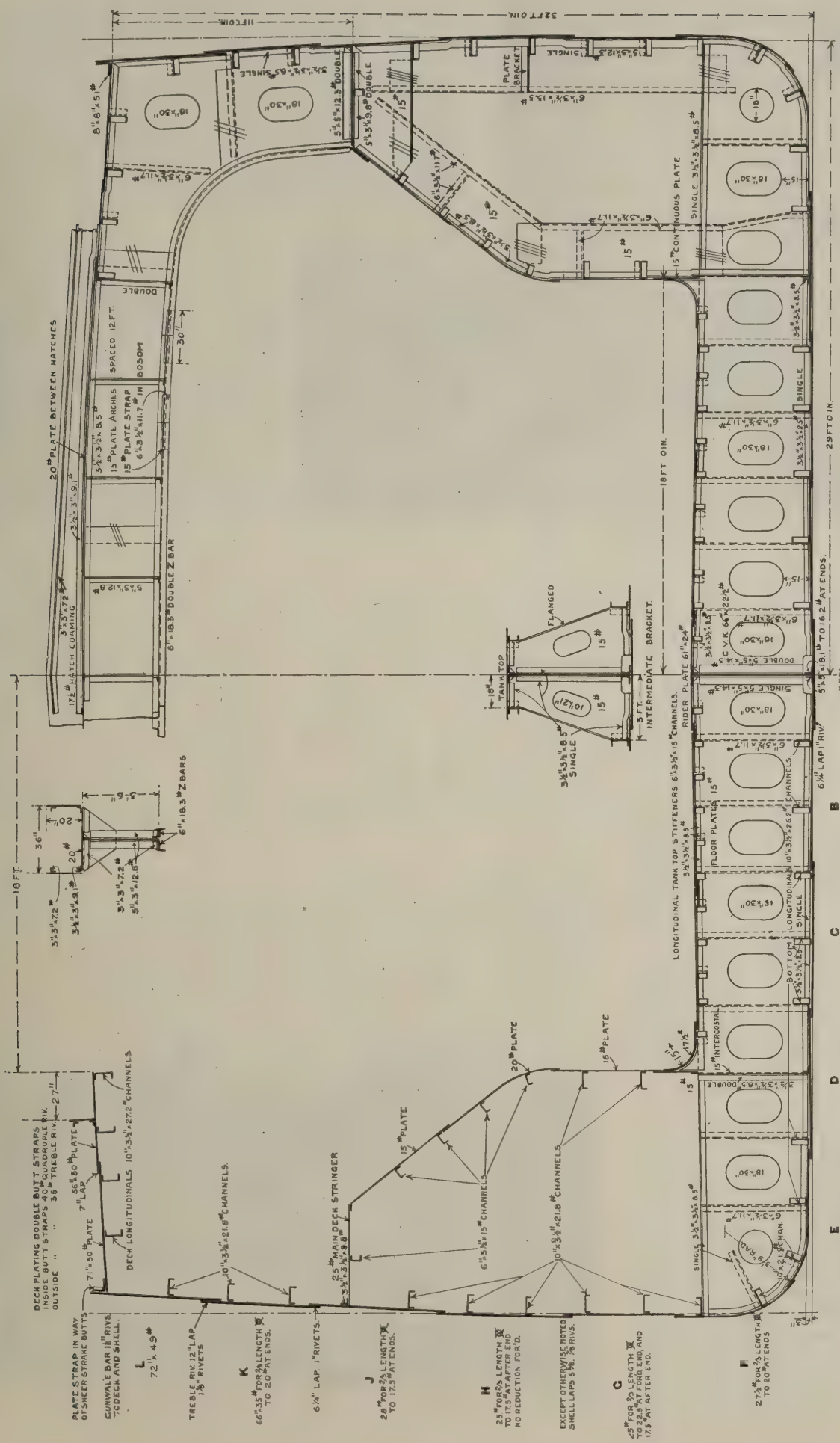
Brief addresses were also made by A. F. Harvey, assistant general manager of the Pittsburg Steamship Co., R. W. Ney, general manager of the American Steel & Wire Co., and A. T. Allen, secretary of the Steel & Wire Co.

The Palmer is 600 ft. over all, 580 ft. keel, 58 ft. beam and 32 ft. deep. In the Isherwood system of construction it may be stated that the transverse frames and beams are fitted at widely-spaced intervals, the general practice, so far, having established this at about 12 ft. These structures form complete transverse belts around the ship. They are directly riveted to the shell plating and deck of the vessel, and are made of not less strength than the number of transverse frames that are fitted in ordinary vessels for a corresponding length of ship. These strong transverse girder frames are slotted around their outer edges, in order to admit of continuous longitudinal stiffeners being fitted, not only at the decks but on the sides, bottom and tank top. The fitting of these longitudinal stiffeners directly on to the plating prevents damage to the decks through buckling, an advantage over vessels of the ordinary type which have had no direct fore and aft support to the plating in between the transverse beams. In vessels with double bottoms, transverse floor plates are fitted intermediate to those at the sides and decks of the vessel. These intermediates enable sectional materials, such as bulb angles or channels being utilized as longitudinals, both at the tank top and on the outside plating, thereby providing a double bottom construction, which is much more ready of access than one built on the ordinary system.

It is claimed for the system that it affords a better distribution of metal, making a lighter and stronger ship, and in fact it is predicted that it will eventually supercede the transverse type on the lakes. The saving in weight of material is effected by dispensing with beam knees, a number of bilge brackets, tank knees, packing and many transverse connections. As in all steamers of the so-called arch or deep-beam construction, hold stanchions are entirely omitted. As will be seen by reference to the midship section, the Palmer is of the now well-known hopper type with side tanks extending to the height of the main deck stringer. Her transverse girders are spaced 12 ft. apart and extend completely around the ship. In the bottom of the Palmer an intermediate transverse floor plate is fitted, thus giving a spacing of transverses, in the double bottom of 6 ft. In order to withstand the very rough usage the tank top is subjected to in unloading iron ore it will be seen that the tank top plating has stiffeners fitted of an exceptional na-



LOOKING FORWARD, JUNE 4, SHOWING TRANSVERSES AND FIRST SECTIONS OF SIDE TANKS.



MIDSHIP SECTION OF THE BULK FREIGHTER, WILLIAM P. PALMER.

LOOKING FORWARD, JUNE 19.

ture and the tank top plating is of very substantial thickness, namely 24 lb. It is claimed that the longitudinal strength of this vessel particularly as regards the bottom of the structure, is in excess of that of similar vessels built on the ordinary type of construction. This is considered an advantage in the type of ship with machinery weights in the extreme after end. The Palmer is being built to the Lloyds register and under the direct supervision of James French, Lloyds surveyor for the great lakes, with headquarters in Cleveland.

Work upon the Palmer has been rushed since the launching and were it not for the fact that the season is ending so abruptly would probably make a trip this fall. Her cabin accommodations are very elaborate and she will undoubtedly do her share in entertaining the guests of the United States Steel Corporation.

Canada's New Navy

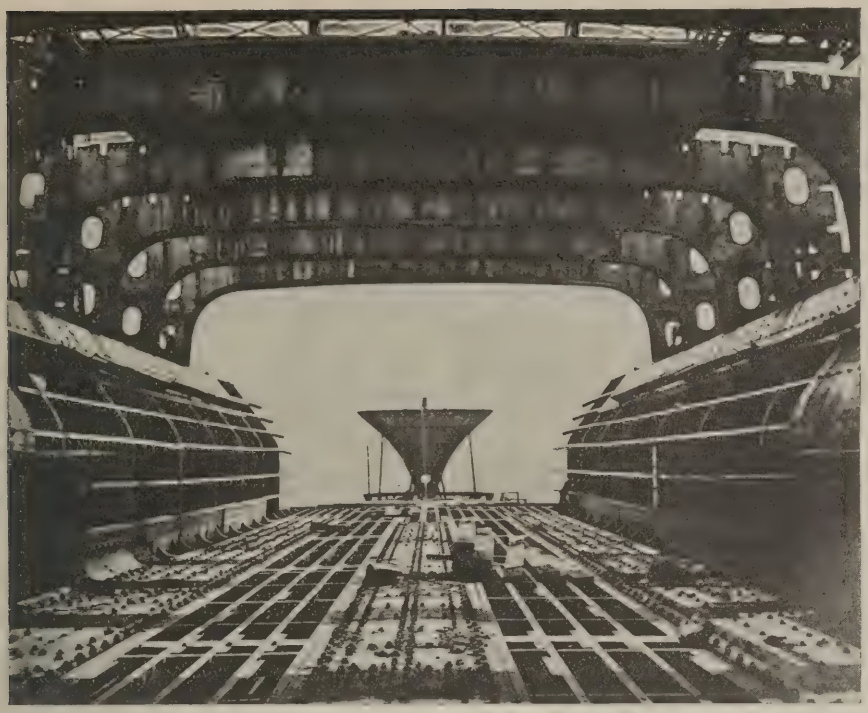
Sir Robert W. Parks has returned to England after a two months' visit to Canada, where he has been engaged in connection with the proposed dry dock at Quebec and the Georgian Bay canal from the great lakes to the St. Lawrence. He has since his return given his opinion anent the progress which the Canadian government is making with the scheme for the construction of the Canadian navy, that the only practical basis upon which British ship constructors could work in Canada, and especially undertake the construction of the Canadian navy, would be by securing from the government a very substantial bounty upon ship building in the dominion. "It is absolutely certain," he says, "that no ship building could be profitably conducted on the maritime coasts of Canada in competition with the British ship building yards."

The Canadian government has made it a condition that the new navy should be built in Canada, but that none of the ships should be constructed at any of the lake ports. It seemed therefore certain that either the port of Halifax or St. John will be selected as the naval base and the center of the new industry, if established under the protection of the dominion government. The ports of St. John and Sydney are of course rivals in this matter to Halifax, and probably the British government, the admiralty and the war office will be entitled to be consulted before any definite decision of the Canadian government is taken as to the selection of the port on the Atlantic seaboard for the new naval station. Whatever site is selected, Sir Robert Perks thinks it is certain that no yards for naval purposes could be profitably established unless the future commercial ship building trade of Canada is taken into consideration.

On the question of bounties, Sir Robert Perks further says:

"This unquestionably is likely to be very large in years to come, but in its early stages the industry, if established at all in Canada, will have to be nurtured just as the steel trade has been by a system of bounties. While such a system is absolutely necessary and would be reprobated in England by thoughtful economists, whether taking the shape of government bounties or protection, yet in Canada, with the fierce competition of the United States, it is quite clear to people who study the commercial conditions of the dominion today, that a policy of absolute free trade to Canada would spell complete ruin to multitudes of thriving manufac-

LOOKING AFT, JUNE 19.



LOOKING AFT, JULY 23, SHOWING TANK TOP, SIDE TANK AND ARCH BEAM CONSTRUCTION.

turing concerns, and would involve thousands of skilled mechanics being thrown upon the streets."

Alluding to the new dry dock scheme, at Levis, Sir Robert mentioned that the plans and detailed drawings had now been lodged with the dominion government, in accordance with the dry dock subsidy act of May last, and the joint stock company headed by the Canadian Pacific railway and the Allan line had been registered in Canada for carrying out this work. "The dock," said Sir Robert, "will be of the largest type, 1,000 ft. long, and will be entitled to the subsidy on the first scale guaranteed under the dominion dry dock act of 3½ per cent on $4,000,000 for 35 years."

The company's financial arrangements are all concluded, subject to the assent of the dominion government, and all the plans and schedules which were lodged witht the government on Sept. 28 are now under their consideration.

Annual Meeting of the American Ship Building Co.

THE annual meeting of the stockholders of the American Ship Building Co. was held in Jersey City, N. J., on Oct. 13. No change was made in the directorate or officers. W. L. Brown continues as chairman of the board of directors, James C. Wallace as president, Russell C. Wetmore as vice president and treasurer; Ora J. Fish, secretary and assistant treasurer; R. B. Wallace, general manager; James H. Hoyt, general counsel and M. A. Chew, assistant secretary.

The financial statement shows that the company is well entrenched, the sum of $884,322.27 being added to surplus, making the surplus as of June 30 last, $7,003,974.73. Cash on hand totalled $902,045.02. President James C. Wallace in his annual report says:

The year's business of the company has been quite satisfactory, both in volume and results.

CAPITAL STOCK.

Remains unchanged from last year, viz.:

AUTHORIZED.

Preferred	$15,000,000
Common	15,000,000
Total	$30,000,000

ISSUED.

Preferred	$ 7,900,000
Common	7,600,000
Total	$15,500,000

Dividends.

Regular quarterly dividends of 1¼ per cent have been paid on the preferred stock, and four quarterly dividends of 1 per cent have been paid on the common stock.

PROPERTY OWNED AND CONTROLLED.

CLEVELAND, O.
Construction yard, machine shops, foundries, boiler shops, three dry docks.

LORAIN, O.
Construction yard, two dry docks, machine shop, boiler shop.

DETROIT, MICH.
Machine shops, boiler shops, foundry, brass works, three dry docks.

WYANDOTTE, MICH.
Construction yard, machine shop.

SUPERIOR, WIS.
Construction yard, machine shop, two dry docks.

CHICAGO, ILL.
Two construction yards, two machine shops, three dry docks.

MILWAUKEE, WIS.
Machine shop, two dry docks.

BUFFALO, N. Y.
Construction yard, machine shop, three dry docks.

PORT ARTHUR, ONT., CAN.
Construction yard, one dry dock.

Condition of the Property.

The various properties have been kept in good condition and up to the highest standard of efficiency.

At Buffalo there has been completed a new modern, fully equipped, 700-ft. dry dock, and in place of destroyed by fire, an office building and boiler house.

At Port Arthur, Canada, your chairman and president have given considerable attention to the work of construction, and hope that by Jan. 1, next, we will have in operation there, a 700-ft. dry dock, steel punch shop building, machine shop, building berth and equipment, and the plant generally in condition for operation, and we have very satisfactory assurances of a fair volume of business.

At Lorain a new forge shop, capable of making the heaviest forgings that are used in vessel construction, will be completed and in operation Nov. 1, next.

VESSELS BUILT.

Plants.	Vessels built.	Carrying capacity. Net tons.
Superior	1	9,500
Lorain	12	102,000
Cleveland	2	19,000
Detroit	6	23,000
Buffalo	2	.....
Chicago	0	.....

TOTAL.

Vessels built	23
Carrying capacity, net tons	153,500

Carrying capacity is based on 19-ft. draught.

Summary and Prospects.

The company has built and completed 23 vessels during its fiscal year, and now has under contract 12 vessels. The general introduction of larger and heavier ore unloading machinery is making certain changes in vessel construction necessary, and while the outlook for new construction seems limited and probably will be, we have assurances of considerable work in repairs and changes in construction that will give us a fair business during the year.

The financial report as submitted by R. C. Wetmore, treasurer, is as follows:

COMBINED ASSETS AND LIABILITIES, JUNE 30, 1910.

ASSETS.

Cost of real estate, buildings, machinery and tools, patterns, patents, models, furniture, fixtures, etc., as per books, including cost of stocks in subsidiary and affiliated companies			$17,904,086.12
Sundry bonds and stocks, at cost or less			884,400.00
Material and supplies, at market values			510,267.03
Notes and accounts receivable:			
Notes receivable		$2,026,918.32	
Accounts receivable		1,880,087.75	
Accrued on uncompleted contracts		821,790.79	
			4,728,796.86
Cash			902,045.02
			$24,929,615.03

LIABILITIES.

Capital stock:			
Common		7,600,000.00	
Preferred		7,900,000.00	
			15,500,000.00
Notes and accounts payable			1,166,518.71
Reserves:			
For insurance		209,707.49	
For maintenance		500,000.00	
For dividends (payable July 15)		138,250.00	
For contingent earnings on unfinished construction, 1909-10		100,000.00	
For sundries (taxes, liability insurance, expenses, discounts, allowances, etc.)		311,164.10	
			1,259,121.59
Surplus, including working capital:			
Balance, June 30, 1909		6,423,652.46	
Less common dividends		304,000.00	
		6,119,652.46	
Surplus for year ending June 30, 1910:			
Earnings, including $100,000.00 contingent earnings on unfinished construction 1908-9 (before deducting maintenance and depreciation)	$1,980,654.21		
Less:			
Maintenance	$272,032.19		
Rebuilding docks, etc.	271,299.75		
	543,331.94		
	$1,437,322.27		
Less preferred dividends	553,000.00		
		$ 884,322.27	
			$ 7,003,974.73
			$24,929,615.03

Note:—In addition to the foregoing there exists a contingent liability from the guarantee of first mortgage bonds on steamships built by the company, aggregating $1,535,000, and carrying interest.

Mr. Newberry and Shop Yard Management

In its October issue, THE MARINE REVIEW reprinted an article from *The Independent*, by Rear Admiral Caspar F. Goodrich, on "Mr. Newberry and Shop Yard Management." Brief reference to the article in the *Army and Navy Journal* drew comments from Rear Admiral George W. Melville which make quite interesting reading:

"The reference in the issue of the *Army and Navy Journal* of Sept. 24 to a brief article by Admiral Goodrich in the *Independent* of Sept. 15 may have led some who would not otherwise have seen it to look it up. The admiral has long been known as a clever writer, and as such he has the art of giving a specious attractiveness to ideas that are either inaccurate, irrelevant or else of the kind that have the same general acceptance as the Ten Commandments. Inasmuch as the admiral was, perhaps, the chief lieutenant of ex-Secretary Newberry in the abortive attempt to carry out what has been called 'the plan to disorganize the navy,' no one can blame him for frequent efforts to defend that scheme; but it is only fair, in the interest of accuracy and correct information, that attention should be called to the facts in the case and to some of the peculiarities of the *Independent* article.

"In the first place, the bulk of the article is taken up with a partial description and some examples of a most ingenious scheme of shop management, devised by one of our most brilliant engineers, but which, unfortunately, in the judgment of most competent experts, is entirely unadapted to the conditions of navy yard work. It would seem that any experienced naval officer ought to recognize that navy yards are unlike manufacturing establishments, which are employed almost entirely on repetition work, while the yards hardly have any two jobs exactly alike. Practically all shop 'systems' are based on the idea of repetition work, and the one which the admiral so justly admires for its ingenuity is particularly so. It is further to be said that, although this system receives general admiration from shop managers, they do not adopt it, recognizing that, unfortunately, only such talented men as its brilliant author can make it work.

"The admiral sketches an outline of a course of training for shop managers, which, with one addition (which he perhaps thought insignificant), would probably meet with general approval. This addition is 'common sense,' which the most competent men nowadays are ranking higher than mental ability. Indeed, it has seemed to me right along that the Newberry system was wrecked just because it utterly ignored this vital element. Common sense would have suggested a careful investigation as to the methods employed by our great manufacturing and building establishments, *as far as applicable to navy yard conditions*, but there was no such investigation, if we can judge by results, because the Newberry system was unlike anything to be found anywhere. Indeed, the particular point to which the admiral refers with pride, the consolidation and concentration of shops, is exactly what the most progressive establishments are not doing. On the contrary, they are working toward the general lines on which the navy yards were conducted before the Newberry scheme.

"The little episode about the $50,000 superintendent is splendidly told, and it would convince anyone who didn't know what salaries really are paid. I do not doubt the admiral's account is correct, but it would have been still more interesting if he had given names and localities. My opportunities for information in this respect have been very good, and I am free to say that I do not believe any such salary has ever been paid. There is one good feature about this part of the discussion, namely, the disclosure of one naval officer of extreme modesty as to the ability of naval officers generally. We used to hear it charged against them that they considered their commission a sort of 'divine right,' enabling them to do anything. We now learn that this is all wrong, and that it is doubtful if they can be equal to filling positions which are filled efficiently by men without a tithe of their training and opportunity. Here again, it seems to me, a moderate application of common sense would have led the admiral to be more hopeful of his brother officers. There are now more than a thousand line engineer officers. The number needed for the chief positions in the navy yards is probably under fifty. To say that, with any kind of decent training, these fifty men cannot be obtained out of a thousand highly trained men, who are picked at the start, is beyond my powers of imagination. One can fancy the joy of any large manufacturing concern that had such a chance.

"Looking at the matter soberly, and without any bias, this question of navy yard management is not such a terrible puzzle to solve. It is a very old problem, and we have had it solved for a great many years. It only requires the usual expert knowledge and

common sense, both of which were and are available in ample supply. It is gratifying to all who love the navy that our present secretary went at the question in this simple and intelligent way, and I believe that the organization, as it has been planned by experienced officers and approved by him, is along correct lines. Within a few weeks he called a meeting of commandants of yards and chiefs of bureaus for conference as to progress and possible improvement. When such a spirit prevails success and the highest efficiency are assured.

GEORGE W. MELVILLE, Rear Admiral and Ex-Engineer-in-Chief, U. S. N. Retired.

"Admiral Melville's communication drew the following spirited reply from Admiral Goodrich:

"Those who are acquainted with ex-Engineer-in-Chief Melville will be able to make the proper allowances in reading his letter on 'Shop Management in Our Navy Yards,' printed in your issue of Oct. 8. Those who are not acquainted with him will be surprised, if not pained, to find a naval officer indulging in personalities when discussing a question which interests all who seek what is best for the service, and who are, therefore, glad to adopt any measure, however opposed to their own preconceptions, which shall achieve this desirable end.

"The public press is no place for insinuations of 'specious' advocacy of 'inaccurate' or 'irrelevant ideas' or 'Ten Commandment' truisms, except on the well known legal principle of abusing the plaintiff's attorney when you have no case; nor is the public press a proper place for answering such insinuations.

"The system, which the ex-engineer-in-chief assumes to be that of my preference, needs no defense from me. Those who have tested it and found it satisfactory are quite ready to speak in its favor. The best methods are none too good for the navy. I feel sure that, eventually, they will be installed in our yards. I care not by what name they are called or whence derived.

"I do not doubt the ex-engineer-in-chief in the least when he says that he is unaware of such salaries as the one I mentioned, $50,000 annually to the superintendent of a certain huge industrial plant. That he does not know of such salaries is, of course, no proof of their non-existence. More than half the human race do not know that the world is round.

"The statement that 'the most progressive establishments' are opposed to 'the concentration and consolidation of shops' is unsupported by instances adduced. The multiplication of shops doing the same kind of work, as under the old bureau plan, may be favored somewhere, possibly, but it hardly commends itself to that 'common sense' upon which he lays no more than the proper stress. Establishments with this tendency would most profitably be sought in the list of bankrupts. It is astounding to infer his approval of the ancient navy yard system from the remark that 'the question of navy yard management' is 'a very old question, and we have had it solved for a great many years.' I was mistaken, it seems, in thinking that particular solution wholly discredited and without defenders. If so admirable, why does he commend the present policy, which eliminates it?

"I have elsewhere said that the earnestness with which the subject is now being attacked forbids any doubt that a fitting organization and administration in our shore establishments will be sought and adopted, but it may be confidently predicted that 'the general lines on which the navy yards were conducted before the Newberry scheme' will be conspicuous by their absence.

"I am forced to wonder whether the ex-engineer-in-chief has read with any care my article in the *Independent* for Sept. 15, which he criticizes. It was a frank recognition of what has been done and is now doing; a counsel of hope and appreciation, not of despair and depreciation. It indicated the difficulties, which it did not seek to evade or ignore, and it pleaded for that training which alone is needed to enable our men, the very best of material intrinsically, to undertake with self-reliance and to discharge with credit their important responsibilities when detailed as shop managers. I trust that no one will form a judgment without consulting my own words.

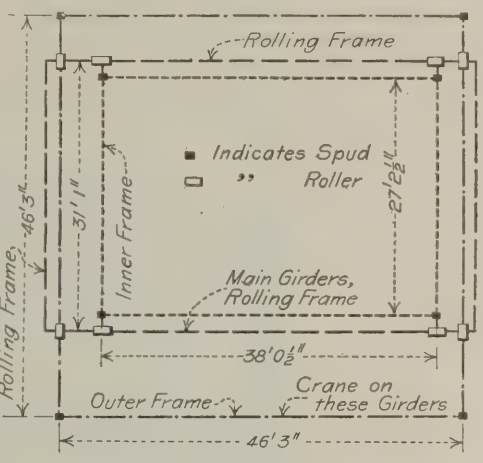
C. F. GOODRICH."

Self-Propelling Marine Staging

(From the *Engineering Record.*)

For some years there has been in use in England a so-called marine locomotive staging, which is a self-contained propelling platform capable of walking into the water and thus serving instead of temporary staging or barges for the construction of marine works or the excavation of subaqueous rock.

The first one was used at Peterhead, a fishing port north of Aberdeen, Scotland, for the removal of about 10,000 cu. yd. of granite, lying at a depth of about 24 ft. below high water. The North Sea along this coast is rarely calm enough to permit borings to be made from barges and severe storms come frequently and make it inadvisable to place floating equipment in exposed positions. This situation led to the design of the locomotive staging, which withstood heavy storms though the waves sometimes broke over the platform. The staging carried five drills, and was arranged to advance 5 ft. at a time, this distance corresponding to the spacing of the



RELATION OF PARTS OF MARINE STAGING.

holes. Air was brought to the drills from shore through a submarine hose, and as the five holes were completed they were blasted directly under the platform.

Subsequently this machine was moved to Dover, where it was used by the British Admiralty in blasting for deepening the harbor.

The stage shown in the accompanying photograph was built for Messrs. W. Hill & Co., for their work on the harbor improvements at Whitby, where it was used instead of temporary falsework for building the west pier extension. Two stages of this type were used on this work. The general dimensions are shown in the sketch herewith, all lengths being center to center of the framework members shown.

The device, it will be seen from the sketch and the photograph, consists essentially of two independent structural steel frame works, one within the other, so arranged as to move independently and to act as a support, the one for the other, in moving. Each frame has four legs or spuds which can be raised independently of each other. The method of operation is as follows: If it be assumed that the inner frame is to be moved, the legs on it are raised, in which condition it is carried on rollers resting on the outer frame. It is then hauled forward by tackles attached to the outer frame. The spuds on the inner frame are then lowered, and those on the

outer frame raised so that the outer frame is carried on rollers resting on the inner. The outer frame can then be pulled forward, the operations being continued until the staging reaches the desired place. In practice a third or rolling frame must be used, this frame acting as an intermediate carrying member between the inner and outer frames. The accompanying sketch indicates the relation between the parts of the machine. The inner frame travels on the rolling frame, and the latter, in turn, moves on the outer one. The height of the framework is 34 ft.

SELF-PROPELLED MARINE STAGE AT WHITLEY HARBOR.

It will be noted that the machine can move forward or backward and sidewise, and that in this particular apparatus the forward and backward progress can be made in steps of about 10 ft., while the steps sidewise are limited to about 5 ft. Only four rollers are provided for the lengthwise motion and four for the sidewise, though the inner frame at times carries the outer and at others is carried by the outer frame. This is possible by the use of double tracks, one above and the other below each set of rollers.

The spuds are each operated by an independent motor with horizontal shaft carrying a worm engaging a gear placed as a collar around the upper end of the spud. This part of the spud is a threaded shaft, while the lower part is a stout square timber which works up and down inside a structural-steel leg, giving lateral strength.

The construction plant was mounted mainly on the inner frame, while the outer one carried a gantry with overhanging ends.

One of these stages is said to have traveled a total of 3,600 ft. over sand bottom, at a rate of 310 ft. in 10 hours, its stride being 10 ft. Later when the crew became more experienced a 10-ft. step was completed in 15 minutes. The motors operating the spuds are all controlled from one switchboard so that they can be operated by one man. Both stages were frequently exposed to rough weather without damage.

Beside using the machine for blasting, rock removal and the construction of piers, it can readily be used for setting caissons, recovering sunken cargo, making subaqueous borings and carrying out a variety of operations in exposed locations where barges would be unsatisfactory on account of their movement or temporary falsework would be expensive or would be endangered by storms.

A model of the staging is being exhibited at the United Engineering Societies' building, in New York, by C. G. Norris.

Progress of Parsons Turbine

Some interesting particulars of the progress of the steam turbine are given in the annual report, just issued, of the Parsons Marine Steam Turbine Co. The directors state that the application of the Parsons type in war vessels and in vessels of the mercantile marine has been greatly extended during the past year. Up to the present time the total horsepower of turbine engines completed and under construction in the works of the company and of licensees, as well as in the works of the Continental sub-companies and of licensees of Parsons' Foreign Patents Co., amounts to 4,500,000 h. p., an increase during the year of 1,250,000 h. p. Of this total nearly 3,700,000 h. p. are, or will be, employed for the propulsion of warships, and over 800,000 h. p. in vessels of the mercantile marine and yachts.

The British admiralty took the lead in the introduction of the Parsons type of turbine into warships, and has continued to employ that type in nearly all the vessels laid down during the last five years. At present the total number of vessels built and building for the Royal navy and the colonies with Parsons turbines is 143; the total horsepower is about 2,100,000. In all the important war fleets of the world the lead of the British admiralty has been followed, and the Parsons type of turbine has been largely used in recent ships. The United States navy department has adopted the Parsons type for the four large battleships now building, and for 15 destroyers. The French ministry of marine have adopted the Parsons turbine for all the eight first-class battleships now building, and for 10 torpedo vessels. In the German navy all the large armored cruisers recently laid down have Parsons turbines; that type has been adopted also for four protected cruisers and eight destroyers. The trials of the armored cruiser Von der Taun, fitted with Parsons turbines, have proved most satisfactory, the speed at-

tained on trial being 27½ knots, as against a speed of 25 knots said to have been contemplated when the design was prepared. In the Italian navy three large battleships, an armored cruiser, and three smaller vessels have Parsons turbines. Spain is building three battleships, three destroyers, and 10 torpedo boats, for which the same type of engines has been adopted. Denmark, Sweden, Brazil, Argentina and China have also made use of the Parsons turbine in recent war vessels. Experience on a very large scale in war vessels on actual service has now confirmed the favorable results obtained on the trials of turbine-driven ships.

Success in Mercantile Marine.

Equally satisfactory results have been obtained in vessels of the mercantile marine fitted with Parsons turbines. The Cunard steamships Lusitania and Mauretania have continued to maintain high speed and remarkable regularity of performance in all weathers on their voyages between Liverpool and New York. The Allan liners Victorian and Virginian and the Cunard steamship Carmania also continue to give great satisfaction. The French Trans-Atlantic Co. has adopted Parsons turbines for their new steamship La France, recently launched, for which the speed of 23 knots is contemplated. The Canadian Northern Railway steamships Royal George and Royal Edward (formerly Heliopolis and Cairo) are fitted with engines of the same type, and have performed their service between Bristol and Canada with great success. The Japanese steamships Tenyo Maru and Chiyo Maru, propelled by Parsons turbines, have fully realized the intentions of their design on their trans-Pacific service. It has been reported recently that orders have been given for a turbine-driven steamship for the service between England and New Zealand, and there is good reason for the belief that the Parsons type of turbine will be adopted to a much greater extent for oceanic service in vessels of high speed of the mercantile marine. In swift vessels of comparatively moderate dimensions, but great engine power, employed in cross-channel and coasting services, or for short voyages, the use of Parsons turbines has been considerable, and recently has been much extended. In Italy, France and the United States, as well as in Great Britain, recent and important examples of this development have occurred.

The "combination" system devised by Mr. Parsons, in which low-pressure turbines are associated with reciprocating engines, is also being developed for mercantile steamships of comparatively moderate speeds, and has given very satisfactory results in working, especially as regards fuel economy. Amongst the vessels in which this system has been adopted are the great White Star liners Olympic and Titanic, now building by Harland & Wolff, and the Laurentic, built by the same firm. A vessel for the Aberdeen Line, now building at Belfast, and an Orient Line steamer, builidng by John Brown & Co., Clydebank, are also to have the combination system applied. The New Zealand Shipping Co., who first tried that system in the Otaki (built by Messrs. Denny), have extended its use to other vessels as a result of experience. The steamer Rochambeau, now building in France, is to be similarly equipped.

Cargo Steamer Vespasian.

In the last report reference was made to the cargo steamer Vespasian, which had been purchased by the company, and was then being fitted with a system of geared turbines in order to demonstrate the possible economy in fuel, weight, and space which that system of machinery would secure, as compared with the best type of reciprocating engines fitted in cargo steamers of low speed and great deadweight capacity. During the past year extended trials of the Vespasian have been made, both on the measured mile and on ordinary service at sea; thorough investigations have also been carried out to determine the actual consumption of steam and coal. On the first trials, made off the Tyne, it was demonstrated that at ordinary sea speeds the geared turbines reduced the steam consumption 15 per cent as compared with the consumption required with reciprocating engines. Since these results were obtained the vessel has been continuously employed on sea service, carrying coals to Rotterdam, and returning in water ballast. She has completed 14 voyages, and steamed 8,500 miles in all weathers. The machinery has worked with entire satisfaction, giving no trouble whatever, and there has been a remarkable freedom from racing, even in the roughest weather. The results obtained on the first trials as to the relative economy in steam consumption, when compared with reciprocating engines, have been confirmed by the data obtained on these voyages. It may, therefore, be anticipated that the geared-turbine system will hereafter find extensive use in the very numerous and important class of cargo steamers of the British and other mercantile marines by which the carrying trade of the world is principally performed. Other important applications of the system of geared turbines are also under consideration and experimental investigation.

Society of Naval Architects and Marine Engineers

The eighteenth general meeting of the Society of Naval Architects and Marine Engineers will be held at the Engineering Societies building, 29 West Thirty-ninth street, New York, on Nov. 17 and 18. The banquet at the conclusion of the meeting will be held in the Astor gallery, Waldorf Astoria. The list of papers to be read and discussed follows:

Thursday, Nov. 17, 1910.

"Notes on the Armaments of Battle Ships," by Sir William White, K. C. B., honorary member.

"The Evolution of Screw Propulsions in the United States," Part II, by Charles H. Cramp, vice president.

"The History and Economic Value of Canals; with Special Reference to the Cape Cod Canal," by Jacob W. Miller, vice president.

"Coaling War Ships; Notes of Progress," by Spencer Miller, member.

"Floating Dry Docks in the United States; Relative Value of Wood and Steel for Their Construction," by William T. Donnelly, member.

"Our Constitutional Shipping Policy and the Compact for its Establishment," by William W. Bates, member.

"An Analysis of Tests of Watertight Bulkheads, with Practical Rules and Tables for Their Construction," by Professor Wm. Hovgaard, member.

"Comparative Results in Steam and Coal Consumption, with Turbines, Reciprocating Engines and a Combination of the Two, on the Steam Yacht Vanadis," by Clinton H. Crane, member.

"The Gyroscope for Marine Purposes", by Elmer A. Sperry, member.

"New Propelling Machinery of S. S. Creole," by John F. Metten, member.

"Some Suggestions for Reducing Loss by Fire on Shipboard," by Samuel D. McComb, member.

"Two Marine Installations of Producer Gas Power," by Charles B. Page, member.

The Newport News Ship Building & Dry Dock Co., Newport News, Va., launched the freight and passenger steamer, Madison, for the Old Dominion Steamship Co., on Oct. 8. The Madison is 372 ft. long, 42 ft. beam, and 35½ ft. deep. She will be equipped with triple-expansion engines and Scotch boilers.

Building the Panama Canal ---For Whom?

(From the *New York American.*)

The United States is spending the stupendous sum of $375,000,000—which will probably be increased to $500,000,000—on the construction of the Panama Canal. After France failed in the task, this country took it up and is now pushing to a successful conclusion the greatest engineering feat the world has seen. The completed work will be a monument to American genius, enterprise and pride, but as a canal it will benefit *whom?* Take the Suez Canal, the present plexus of the world's seaborne commerce.

During the last recorded year, 13,633,283 tons of shipping passed through this canal. Of this tonnage more than 60 per cent was British, the balance being principally German and French. The United States tonnage was absolutely negligible. Judging from this, the Panama Canal will prove a marvelous benefit to shipping—but to whose shipping?

The Pacific, the ocean of the future, grows in importance every day, and especially in importance to this country, with its great western frontier facing the Orient. In the Pacific will be fought the battle of commerce and in the Pacific, should affairs come to a sterner contest, will be fought the great sea fight that shall decide the fate of nations. What have we done in the Pacific toward winning the battle of commerce? Nothing. The Great Northern Steamship Co. struggles against subsidized competition to keep up its Seattle-Japan service, and that is all.

In the meantime consider the Nippon Yusen Kaisha. In 1885, this Japanese company ran a small line from Kobe to Corea and Vladivostok. Now, with 79 steamships and a tonnage of 306,674, this company, in addition to its European service, maintains a fortnightly service across the Pacific to Seattle, and among other Pacific enterprises operates between Japan and China, Corea, Asiatic Russia, India and Honolulu in our own Japanned Hawaiian Islands. And, incidently, so far back as 1894, during the Chinese-Japanese war, this company alone transported to China 120,000 soldiers and 100,000 coolies. Is there no Philippine hint in this?

The opening of the Panama Canal, which we are constructing at such cost of labor and treasure, will marvelously increase and benefit shipping in the Pacific. Judging from the above, whose shipping? Isn't it time the United States prepared to reap some profit from its own enterprise, or is the alien, who already carries 90 per cent of our ocean commerce, to have it all?

Statistics for the Year

On June 30, 1910, the merchant marine of the United States, including all kinds of documented shipping, comprised 25,740 vessels of 7,508,082 gross tons. On June 30, 1909, it comprised 25,688 vessels of 7,388,755 gross tons. The following table shows the geographical distribution, motive power, material of construction, and trade of vessels of the United States for the fiscal year 1910, in comparison with similar data for the year 1909, and also the construction for the two years.

COMPARISON OF MERCHANT MARINE OF 1909 AND 1910.

Classification. Geographical distribution:	1909. Number.	1909. Gross tons.	1910. Number.	1910. Gross tons.
Atlantic and Gulf coasts	17,203	3,500,394	16,999	3,517,132
Porto Rico	83	8,740	85	5,541
Pacific coast	3,378	915,357	3,534	918,489
Hawaii	43	19,120	40	18,102
Northern lakes	3,199	2,782,481	3,273	2,895,102
Western rivers	1,782	162,663	1,809	153,716
Total	25,688	7,388,755	25,740	7,508,082
Power and material:				
Sail—Wood	9,580	1,465,446	8,811	1,405,692
Metal	132	245,630	136	249,781
Total	9,712	1,711,076	8,947	1,655,473
Steam—Wood	9,783	1,157,510	10,534	1,130,535
Metal	1,858	3,591,714	1,918	3,769,826
Total	11,641	4,749,224	12,452	4,900,361
Canal—Wood	745	80,951	674	74,068
Barges—Wood	3,449	760,465	3,508	780,300
Metal	141	87,039	159	97,880
Total	3,590	847,504	3,667	878,180
Grand total	25,688	7,388,755	25,740	7,508,082
Trade—Registered:				
Sail—Wood	448	185,728	354	125,303
Metal	22	45,330	18	33,574
Total	470	231,058	372	158,877
Steam—Wood	349	71,474	354	64,364
Metal	149	507,052	143	492,613
Total	498	578,526	497	556,977
Barges—Wood	644	72,277	636	70,327
Metal	21	5,644	21	5,644
Total	665	77,921	657	75,971
Total registered	1,633	887,505	1,526	791,825
Enrolled and licensed:				
Sail—Wood	9,135	1,281,064	8,457	1,280,389
Metal	107	198,954	118	216,207
Total	9,242	1,480,018	8,575	1,496,596
Steam—Wood	9,431	1,084,690	10,180	1,066,171
Metal	1,712	3,086,008	1,775	3,277,213
Total	11,143	4,170,698	11,955	4,343,384
Canal—Wood	745	80,951	674	74,068
Barges—Wood	2,804	687,924	2,872	709,973
Metal	121	81,659	138	92,236
Total	2,925	769,583	3,010	802,209
Total enrolled and licensed	24,055	6,501,250	24,214	6,716,257
Grand total	25,688	7,388,755	25,740	7,508,082
Construction during the year:				
Geographical distribution:				
Atlantic and Gulf coasts	582	108,904	601	150,828
Porto Rico	8	85	7	131
Pacific coast	276	22,759	279	16,870
Northern lakes	174	100,402	281	168,751
Western rivers	207	5,940	193	5,488
Total construction	1,247	238,090	1,361	342,068
Power and material:				
Sail—Wood	132	20,965	121	15,659
Metal	9	7,985	6	3,699
Total	141	28,950	127	19,358
Steam—Wood	754	25,066	842	23,005
Metal	67	123,142	94	234,988
Total	821	148,208	936	257,993
Canal—Wood	21	2,292	50	5,720
Barges—Wood	251	52,844	229	47,060
Metal	13	5,796	19	11,937
Total	264	58,640	248	58,997
Total construction	1,247	238,090	1,361	342,068

A Method of Using Fuel Oil in Vertical Donkey Boilers

By Robert T. Earle.*

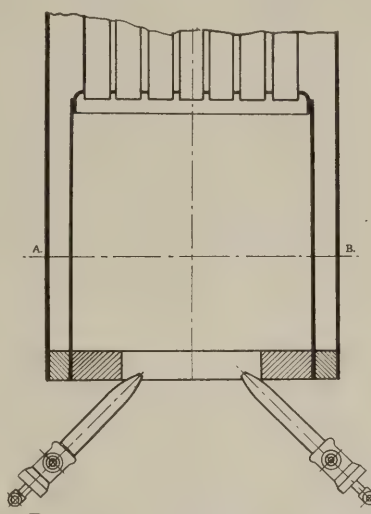
The burning of oil in the firebox of vertical donkey boilers has been attended with some difficulties, chiefly dut to faulty installation. Many people have installed oil burners in donkey boilers in such a way that in a short time the beading on the end of the tubes would be burned off, causing leaks and destroying the tube sheet. The heat would not be uniformly distributed among the tubes as it ought to be, and the boiler would in consequence not steam properly, since the tubes through which the flame did not pass would fill up with soot and the heating capacity of these tubes was lost.

After many experiments and many failures I found that by putting two burners in a vertical boiler, set opposite each other under the mud ring, at an angle of about 90 degrees with each other so that the flame from both burners would meet in the center of the boiler about 20 to 24 in. below the tube sheet, good results could be obtained.

In setting these burners care must be taken that the flames do not meet exactly in the center, but pass a little to one side, giving them a whirling motion. In this manner the flames will fill the firebox and spread over the whole tube sheet and be drawn up through each and every tube.

In this installation no brick are needed around the firebox. I found that an iron plate placed in the bottom of the boiler below the mud ring, and covered with brick so that the mud ring rivets are protected, is all the iron or brick work needed. There should be a hole in this plate to admit the air necessary for proper combustion. I have cut a 12-in. hole for a boiler 60-in. diameter, but I found I had considerable black smoke. A hole about 14 in. diameter gives a nice bright fire. I would advise that a large hole be cut in the plate before fitting in place; it can be easily covered if too large. Conditions will govern the amount of air required.

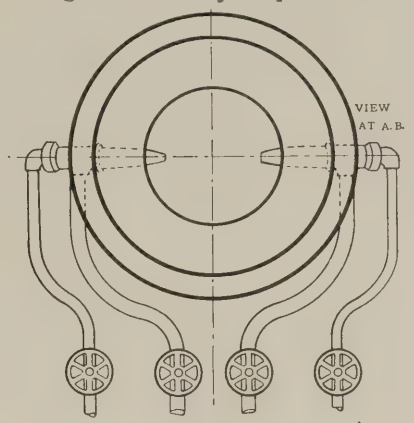
It takes some little experience to regulate the amounts of oil and superheated steam necessary to secure the right mixture and obtain the most heat with the least smoke. Be sure to keep the tubes clean, but if the oil is atomized properly there will be very little smoke to cause soot deposit in the tubes. With burners set in this way, no part of the firebox receives the direct flame from the burners. It is the flame impinging on the tube sheet that injures it.



Position of Atomizer in Firebox.

The flames meeting in the center, too, gives better combustion, as particles of oil that may escape unignited from one burner are burned upon meeting the flame from the other.

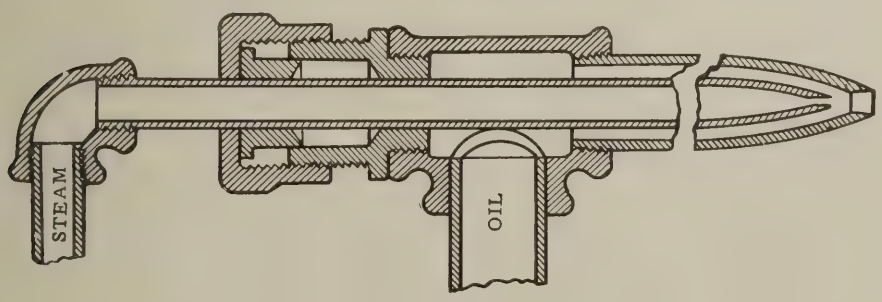
The burners are placed at the bottom of the boilers so that they will not be injured if it should be necessary to start the fire with wood. No pump is required if the bottom of the oil tank is placed not less than a foot higher than the mouth of the burner. The oil should flow to the burners as directly as possible. Connections between the burners and the oil pipe should be made with a piece of heavy hose, so that the burners may be adjusted to the proper position. The steam pipe to the atomizer can be arranged with double ells, ball joints or steam hose for the same purpose. Steam for atomizing purposes should be taken from the highest point on the boiler, and by a separate opening, as the fire does not burn evenly, if the pressure in the atomizer pipe fluctuates and this is necessary for economy. The dryer the steam the better for atomizing purposes. Good results can be had with oil at a temperature of 100 degrees and my experience has proven that this apparatus, if properly applied and adjusted, will give good satisfaction.



Bottom of Firebox.

There is nothing difficult or mysterious about burning oil. Examine a lamp; note how well it burns if the burner is clean and the chimney is in its place drawing air up through the flame. Then stop up a few of the air holes in the burner, and notice the flame; raise the chimney and note how the flame smokes and flutters. A little thought will do the work; any man with pipe tools and a little knowledge of their use can make and install the apparatus.

The burners are known as inside mixers, and are made of pipe flattened on the end to form a mouth. The atomizer is flattened and placed inside the burner; the mouth of the atomizer should be about 1/32 or 3/64 in. wide and as long as necessary for the burner used. One-inch pipe flattened to 1⅜ in. by 5/16 in. or ¼ in. for each burner will give good results in a 60-in. boiler. The atomizer pipe is ¼ or 3/16 in. pipe flattened as above and placed about 1¾ in. or 2 in. back from the mouth of the 1-in. oil pipe. This distance must be regulated to suit conditions, such as quality of oil and steam pressure carried. The plan and detail of the burner show the arrangement. The atomizer pipe passes through a stuffing box in the tee of the burner so that it can be easily adjusted. Once set it need not be moved except to clean out.



Detail of Burner.

*Master mechanic, Oregon & Eureka R. R.

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Naval Reorganization

It is with especial gratification that THE MARINE REVIEW invites attention to the communication printed elsewhere on the subject of naval reorganization; a subject which day by day occupies more and more of the attention of press and public. It is all the more appreciated because of its spontaneity and the unimpeachable character and high standing of the author. It is regrettable indeed that, as he says, the time is inopportune for the disclosure of his identity, although his letter contains nothing which any naval officer might not say without reproach. The attitude of Secretary Meyer toward any who do not unreservedly subscribe to his policy, however, is full justification.

At the same time THE MARINE REVIEW regrets that it cannot wholly agree with the author's views, which are, quite naturally, more or less affected by long naval association. It is quite true that the furnishing of the numberless items of equipment is an incumbrance upon a purely manufacturing department, but on the other hand, the organization and maintenance of a bureau for the purpose is the height of absurdity. It is a store keeping proposition pure and simple and is on all fours with the general store of any large ship building concern which has exactly parallel functions to perform in the delivering of a complete ship. The equipment is either made by the department or purchased in the open market; in the former case the manufacturing department takes care of its production and makes delivery as ordered; in the latter the bureau of supplies and accounts makes the purchase and delivers as required, either to the ship, the shops or the store. The purchases have all to pass through the hands of the bureau of supplies and accounts sooner or later in any case. Assuredly a separate bureau merely for requisitioning and distribution is totally unnecessary.

We have heretofore expressed our opinion regarding Secretary Meyer's staff of aides and their value, and there is no occasion to repeat it here.

When the navy yard is conducted as an industrial and not a military establishment and the commandant and all his train of line officers are banished, results may be looked for and not sooner. This does not involve removal from central control at Washington nor any diminution of effectiveness in the execution of repairs or construction, rather and emphatically the contrary. Ships will be ordered to navy yards and surveys made and repairs decided upon as now, but the execution of all work of whatever nature and the care of all shore property and equipment should be vested in one manager, whose direct superior is the secretary at Washington. Let the bureaus and the general board wrangle as much as they please over designs, as we have before remarked they are principally guesswork anyway, but keep them out of the shops and yards.

Keep the politicians and bosses and heelers away and put the yards on the same basis as to hours and customs as the best industrial establishments in similar work; put into effect a workable, sensible cost system which will tell something, not the crooked, unintelligible juggling which is now in vogue; make a manager's tenure of office dependent on his efficiency and ability and pay the price necessary to get the very best as shown by his record and leave his hands untied and the United States will begin to get something for its money. Necessarily he must be a man of varied attainments and unusual ability but the United States has enough to supply the demand. The chief difficulty lies within the department itself.

Preserve the Wolverine

The proposition of the Navy Department to dispose of the U. S. S. Wolverine (formerly the U. S. S. Michigan) by sale to the highest bidder may lead to some objections on the part of the people on the Great Lakes, who have come to regard that vessel with the veneration attaching to an honorable relic. This may be sentiment, but it will not be the first time that a popular emotion has interfered with an official purpose. It is hardly to be expected that the Wolverine will bring more than $2,000 if sold in this manner, and this may be urged as a reason why the ship should be preserved on account of the interest attaching to the vessel by virtue of its history. The Wolverine was the first iron vessel afloat on the Great

Lakes and the survival of the ship is an illustration of the difference between fresh and salt water agents for the deterioration of iron vessels. The hull was designed by Naval Constructor Samuel Hart, while the engines and boilers were designed by C. W. Copeland, a famous engineer of his day. The hull was built of iron, the material being prepared at Pittsburg and transported to Erie. The ship was launched in 1843 and made the first cruise on the Great Lakes the next spring. The first commanding officer was William Inman and the first chief engineer was Andrew Hebard. The disposal of the Wolverine brings up the interesting question whether the Navy Department may not now take steps to have built the gunboat, carried on the records as "No. 16," authorized by Congress in May, 1898, with an allotment of $260,000, which was also the limit of cost. Not muuch of a gunboat can be built in these days for any such sum, and it is estimated that a vessel of that type would now cost $350,000 at least. The boat was not built at the time it was authorized on account of the treaty prohibitions between this country and Great Britain respecting the maintenance of an armed naval force on the Great Lakes. Perhaps the obstruction may be considered as partly removed by the disposition of the Wolverine.—*Army and Navy Register.*

Well, the Navy Department must be hard up, very hard up indeed, if it wants to sell the Wolverine, better known as the Michigan. The sale of this vessel, the oldest iron vessel in existence, would be little short of a crime. There is no earthly excuse for it. For the business which she has to do, she is just as good today as she ever was. She represents better than any other inanimate object could the cordial relations which exist between the United States and its great neighbor. A modern gun boat could blow her to pieces in a minute, but her very weakness is her greatest strength. She is formidable in her antiquity. This old gun-boat is dear to every port on the lakes. She is as much an institution to the lakes as the little red school house is to the country village. She was in commission before the Mexican war was fought. As ships go nowadays, she was old when Farragut's flag-ship, the Hartford, was launched. She was guarding the American frontier when the British batteries were hammering down the walls of Sebastopol. She was nearly 20 years old when the civil war broke out and she has seen empires come and go.

The Wolverine is not only the first iron vessel to float on the great lakes, but she is also the first war ship to be built of iron in the world. She is the oldest iron vessel in existence, and there is no reason why, with proper care, she may not be doing duty a century hence. She is the most interesting warship afloat today, and to sell her would be a very great pity indeed. She has been a very valuable ship in more ways than one. Much of our steam engineering knowledge is derived from experiments carried out on the Michigan by B. F. Isherwood, afterwards engineer-in-chief of the United States navy. It is not likely that the people of the great lakes will permit this historical old vessel to be disposed of.

Mr. Goulder's New Firm

Messrs. S. H. Holding and F. S. Masten retired on Oct. 15 from the law firm of Goulder, Holding & Masten, Mr. Goulder continuing the business in the old offices in the Rockefeller building. Mr. Goulder's new firm is now in process of organization and an announcement of its personnel will probably be made within a few days. Mr. Goulder as general counsel for the Lake Carriers' Association has been identified with lake practice since his young manhood. His reputation as an admiralty lawyer is international and there have been practically no admiralty cases of any importance on the lakes in which he has not represented either one side or the other. His mental cast is both constructive and judicial and his judgment is highly prized in lake circles. Few movements of any importance affecting the general business of the lakes have ever been made without Mr. Goulder's advice. Mr. Goulder has decided to admit to partnership, W. W. White, who has been employed in his office for some time, and his organization when completed will be well rounded and competent.

Slump in Shipments

The ore movement during October reached the respectable figure of 4,877,441 tons, which is, however, somewhat less than the trade expected. The movement shows a loss of 1,748,360 tons, compared with October, 1909, when 6,625,801 tons were moved. Shipments to Nov. 1, however, show a gain of 3,712,974 tons over the corresponding movement last year, reaching altogether 39,978,308 tons. The ore slump which set in two months ago, however, will be further accelerated during November, and the trade does not now expect that the shipments for the full season will be sensibly greater than those of last year. So many vessels have been put into ordinary and so many shippers have concluded to close the season on Nov. 15 that the movement during the closing weeks this year must be very much less than the movement after Nov. 1 last year, when 5,418,745 tons were moved. The Steel Corporation will ship its last cargoes on Nov. 19.

The lake season is rapidly drawing to a close and will practically be over in a fortnight. The Pittsburg Steamship Co. has retired all its barges and will send many of its steamers into winter quarters as soon as they have made another trip. The ore movement will, therefore, show a very heavy slump during November and the total movement for the year will not be very much more than that of 1909.

Following are the shipments by ports:

Port.	October, 1909.	October, 1910.
Escanaba	928,175	639,444
Marquette	528,195	309,283
Ashland	714,271	380,839
Superior	1,003,956	1,317,902
Duluth	2,002,861	1,223,710
Two Harbors	1,448,343	1,006,263
Total	6,625,801	4,877,441
1910 decrease		1,748,360

Port.	To Nov. 1, 1909.	To Nov. 1, 1910.
Escanaba	4,930,971	4,507,517
Marquette	2,507,712	2,998,503
Ashland	3,136,275	3,817,669
Superior	5,747,454	7,802,254
Duluth	11,850,038	13,089,262
Two Harbors	8,092,884	7,763,103
Total	36,265,334	39,978,308
1910 increase		3,712,974

Lake Michigan ore receipts during October were as follows:

South Chicago, Ill.	473,127
Milwaukee, Wis.	17,474
Elk Rapids, Mich.	9,397
Boyne City, Mich.	13,626
Indiana Harbor, Ind.	17,579
Gary, Ind.	215,815
Fruitport, Mich.	3,404
Elk Rapids, Mich.	4,739
Total	755,161

Annual Report Great Lakes Engineering Works

The annual report of the Great Lakes Engineering Works for the fiscal year ending Aug. 31, 1910, has just been published. It shows that during the year the company built and delivered nine vessels and repaired about 40 vessels in dry dock. President Pessano in his report to the stockholders under date of Oct. 25, promises that the new ship yard at Ashtabula will go into commission during the present fiscal year. The buildings in the new yard are to be of

steel and concrete, and a graving dock capable of handling the largest ships on the lakes will be built of concrete. The plant at St. Clair will be sold and the proceeds expended at Ashtabula. During the year a quarterly dividend of 1½ per cent was paid and the sum of $183,884.28 added to surplus, making the total surplus $431,816.19, after setting aside the sum of $162,500 for special reserves. The company recently floated a bond issue of $750,000 to retire existing bonds and to provide capital for the new ship yard at Ashtabula.

Obituary

A well-known figure in marine circles passed away in Detroit on Thursday, Oct. 27, in the person of Wm. C. Barr, late manager of the Algoma Central Steamship lines. Mr. Barr was born in Detroit in 1853, his parents moving to Port Huron while he was yet at an early age. In 1872 he shipped as an oiler on the steamer Montana, which was launched at Port Huron in that year for the Western Transit line. In the subsequent phenomenal development of the lake marine he was a well-known and prominent figure. Although his education was that afforded by the city schools, Mr. Barr, because of his discriminating and receptive mind and liberal temperament, became a leader among marine engineers. Observant and contemplative, his mental processes seemed to lead him to conclusions which were seldom in error and which, once formed, were held tenaciously, but modestly, and his mode of expression was characteristic; moderate, dignified, yet positive. Modest, almost secretive, as to his own works, he withheld nothing of the credit due to others, and many of the best marine engineers of today owe much to his quiet help and advice and to the judicious good words on their behalf spoken in due season.

In the summer of 1900, Mr. Barr was appointed fleet engineer of the Algoma Central Steamship lines by F. H. Clergue, "the Jason of Algoma," who had wrought the industrial transformation of the Canadian Soo. Clergue needed ships and had bought and brought to the lakes several British-built cargo steamers in addition to a fleet of tugs, passenger and local freight ships, and soon recognized Barr's ability and thorough training as a steamboat man. In the autumns of 1900 and 1901, Mr. Clergue sent his cargo ships down to the sea and kept them employed in European trade and Barr was sent to Europe to look after them, which he did with conspicuous success and in 1902 was made superintendent of floating property for the allied companies and later manager, which position he held up to the fall of 1908, when he was obliged to retire because of a physical breakdown, due to ptomaine poisoning from which he never recovered.

A good companion and keen sportsman, generous and kind hearted even to his own injury, with never an unkind word or criticism of others; a quiet, patient and efficient executive, he will be remembered and missed most by those who had the best opportunity of forming a correct judgment.

Lyman C. Smith, well known on the lakes as the head of the United States Transportation Co. and vice-president and treasurer of the Toledo Ship Building Co., died at his home in Syracuse, N. Y., on Nov. 5. He was better known throughout the country as the manufacturer of the Smith Premier typewriter, out of which industry he amassed a large fortune. Mr. Smith was born at Torrington, Conn., March 31, 1850.

Louis C. Taylor, secretary of the Durable Wire Rope Co., of Boston, Mass., died on Oct. 27.

Henry S. Sill, of the firm of Worthington & Sill, died on Oct. 14. Mr. Sill was one of the best known insurance men on the lakes.

FOUNDERING OF PERE MARQUETTE 18

THE findings of the board of local inspectors of steam vessels for the district of Milwaukee as a result of their investigation of the sinking of the car ferry Pere Marquette 18, have been forwarded to THE MARINE REVIEW by Supervising Inspector Westcott, of the eighth district, and are as follows:

Having completed the investigation of the sinking of the steamer Pere Marquette 18, on Sept. 9, 1910, we have to report as follows:

We examined 26 witnesses and from the testimony submitted, we have arrived at the following conclusion, viz.:

The steamer Pere Marquette 18 left Ludington, Mich., at 11:40 p. m., Sept. 8, 1910, bound for Milwaukee, Wis., with a cargo of 29 loaded cars. Some of the cars were loaded with general merchandise and others with coal. The wind was blowing fresh from the north and a heavy sea was running and continued to make during the night.

At 3 o'clock in the morning of Sept. 9, 1910, an oiler went aft to oil the bearings for the main shafts. These bearings are about 7 ft. below the floor of what is known as the "flicker" or sleeping quarters of the oilers, firemen, water tenders and deck hands.

The oiler found that the entire compartment was full of water and could not get down to the shafts as this water was almost up to the "flicker" floor. He then went back to the engine room and reported to the engineer on watch.

The engineer then went to the pilot house and reported the case to the officer on watch, that "there was something wrong aft. The pumps were on and the water was gaining on them."

The first officer went aft then to investigate and returned to the pilot house and remarked to the wheelsman that "only a deadlight was busted, and it didn't amount to much." The captain was then called and took charge of the ship.

The captain, first officer, and some others of the crew went to the "flicker" and tried to stop the leak in the deadlight, which was on the starboard side. Every one aboard the ship was then called and the vessel headed for the west shore.

While the first officer and the crew were down in the "flicker" trying to stop the leak in the deadlight, three deadlights on the port side gave way, admitting large quantities of water which drove every one out of the "flicker" and completely filled the "flicker" and whole after part of the hull with water.

In order to offset this added weight of water in the hull, the master ordered some of the cars to be run overboard. After putting over 12 or 13 cars, the ship seemed to lighten up aft and the crew felt easier.

At about 4:15 a. m., wireless messages were sent out for help and the life preservers were gotten out for the people aboard. Three life boats were safely launched on the port side and men put into them to keep them fended off from the side of the ship. The steamer seemed to be settling aft.

At about 6:30 a. m., the steamer Pere Marquette 17, a steamer of the same line, was sighted. Distress signals were blown and flags raised. The Pere Marquette 17 bore down upon the Pere Marquette 18 with all possible speed and arrived close up to the 18 at about 7:15 a. m.

The Pere Marquette 17 came up to the No. 18 on the starboard side, which was the weather side. The master of the No. 18 then motioned to come up on the lee side, or port side, which was done. Very shortly after, the No. 18 listed heavily to starboard, the stern started to go down, the bow raised, and she sank very rapidly.

The people aboard the Pere Mar-

PERE MARQUETTE 18, WHICH FOUNDERED ON LAKE MICHIGAN.

quette 18 then began to jump overboard. The life boats of the Pere Marquette 17 were lowered immediately and the work of rescue begun. These boats picked up 32 people. As near as we can ascertain, 27 lives were lost, many because of the sea and floating wreckage.

As to the cause of the accident, we are unable to locate definitely any primary cause. We are of the opinion that the breaking of the three deadlights on the port side, undoubtedly put the finishing touch to the vessel; but as to how the water first got into the after compartment or why it was not pumped out, we are unable to ascertain, inasmuch as all of the officers of the ship, and who had the actual workings of the ship in charge, were lost. Not a single officer survived.

We are confident that the large amount of water found in the after compartment by the oiler at 3 a. m., could never have made through the defective deadlight on the starboard side. From all evidence we could get relative to this deadlight, the amount of water it made could not have filled the after compartment, and any pump aboard the boat would have more than taken care of this leakage.

From the evidence submitted, we find that there were at least two other means whereby water could get into the after compartment without the knowledge of the occupants of the "flicker."

One is by way of the sea-cock for filling the compartment, which might have been opened and closing neglected, or through the 18-in. deck scuttles. The sea might have washed off a scuttle cover and allowed the compartment to fill.

It will always be a matter of conjecture as to what first filled the after compartment before discovery, as those who would know are lost. It is an assured fact, however, that the whole after compartment was full of water at the time of sinking.

Some water was let in forward, and this, together with the cars on the forward deck, placed the ship on an even balance. Then something occurred which destroyed this balance and caused the vessel to sink stern foremost, but what this was, we cannot say definitely. It may have been the giving away of a bulkhead, allowing the water to flow into the engine compartment, or it may be that the cars on deck forward became unfastened and run to the after part of the ship. We have evidence from one man who started to go to the car deck from the forward part of the boat, and he claims that there was not a car on the deck.

As regards the great loss of life, we regret that we are obliged to censure the judgment of one who is dead and unable to defend himself.

It is our opinion, that the master of the Pere Marquette 18 displayed very poor judgment in holding the crew aboard the boat as long as he did. As much as two hours before the vessel sank, we feel that his knowledge and ability as a seaman must have told him, that his ship was in a very precarious condition and dangerous to be aboard of. We think that his efforts were directed more towards saving the ship, than to the saving of the lives aboard his boat.

Respectfully submitted,
(Signed) FRANK W. VAN PATTEN,
(Signed) WILLIAM A. COLLINS,
U. S. Local Inspectors.

As the report says, the source of the water first discovered in the after compartment will probably remain a mystery. There are, however, several possible solutions.

The open sea cock may be dismissed at once. It certainly was not opened after leaving port and it would not require much of a sea cock to flood the after compartment in over three hours, even if it had only been opened immediately before leaving. Was the oiler's round at 3 a. m. the first after leaving port? That could scarcely be. The watches must have changed at midnight and certainly all shaft bearings must have been examined before the ship had been at sea over three hours, and the presence of water from an open sea cock could not possibly have been overlooked.

So with the deadlight and the deck scuttle; any large volume of water making through them could scarcely escape the attention of those below. The giving way of three deadlights probably only hastened the end which was already inevitable.

The entirely probable point of entry was by way of a fractured stern tube or broken stern tube gland. Neither are unknown though fortunately not common, but the volume of water which would find entrance would easily account for the situation as

the oiler found it. In steel ships a fractured tube rarely leads to more than the filling of the peak, but if sluices are fitted and not closed the after hold of course fills also; a gland failure on the other hand floods the after hold compartment directly.

In ships intended for work in heavy ice, as with all cross-lake car-ferries, it is also a common practice to fit one or more large sea-cocks well aft to provide injection water for the condensers because they are less liable to become choked with ice than those further forward, and broken sea cocks and nozzles are also not by any means unknown.

The giving way of three deadlights in a seaway is open to some question unless it is to be believed that they were miserably defective. Pere Marquette 18 was no experiment, however, and embodied the experience of a number of earlier ships built for hard work in winter gales and drifting and pack ice and that her water line fittings were of such a flimsy nature is not credible. Even if the lenses were stove in the blind shutters should have been sufficient. They were not stove by the boats alongside, nor by wreckage from the jettisoned cars because it was not until after they were said to have given way that either boats or cars were put overboard. Undoubtedly the bulkhead did give way, probably due in part to some surging of the water in the after hold caused by the sea running at the time.

The case is unique, in the history of lake navigation at least, in that while other ships have passed out mysteriously they left no soul to give any intimation of what befell. Here, thirty-two people are rescued and yet not one who knows why the Pere Marquette 18 foundered. The Western Reserve left one messenger to tell us that she broke in two, but from the Gilcher, Bannockburn, Hudson, Ira Owen, Clemson, Marquette & Bessemer No. 2, and others came no word to tell of their last hours. From the Cyprus one man came ashore to say that she had taken in water through her hatches.

Of all these, that of the Bannockburn is the most baffling. The others had to fight for their lives in heavy weather; she disappeared in cloudless, calm summer, without a trace. Built for ocean service, of the well known and tried tramp type, she came to the lakes and was swallowed without time to get over a boat or for a man to snatch a cork jacket. Surely the inland seas are not without their share of mystery.

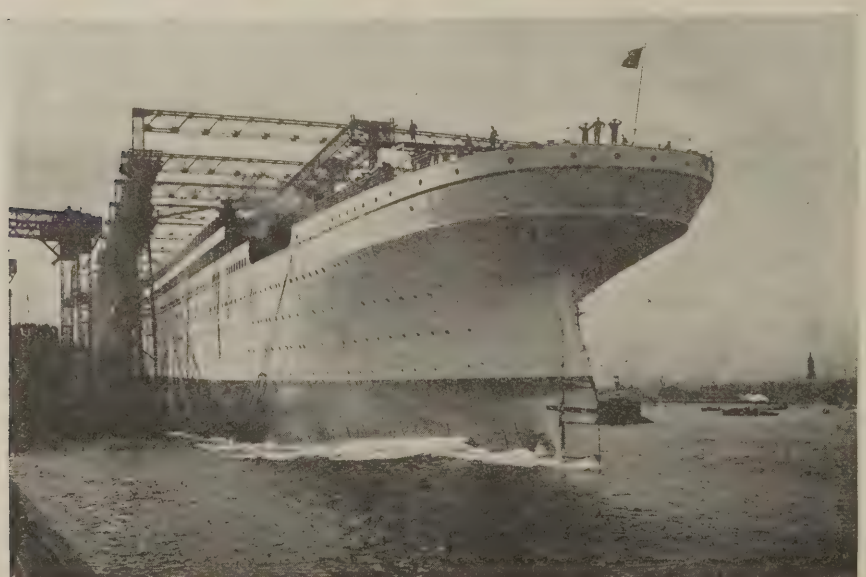
LAUNCHING THE OLYMPIC

THE Olympic, of the White Star line, was launched from the yard of Harland & Wolff, Belfast, Ireland, on Oct. 20. This great triple-screw steamer exceeds by nearly 100 ft. in length and 13,000 tons' displacement any other ship afloat. Her principal dimensions are:

Length over all	882 ft. 6 in.
Breadth over all	92 ft. 6 in.
Breadth over boat deck	94 ft.
Height from bottom of keel to boat deck	97 ft. 4 in.
Height from bottom of keel to captain's house	105 ft. 7 in.
Height of funnels above casing	72 ft.
Height of funnels above boat deck	81 ft. 6 in.
Distance from top of funnel to keel	175 ft.
Number of steel decks	11
Number of watertight bulkheads	15

The launching weight, about 27,000 tons, was the heaviest weight ever transferred from land to water, and this operation, always (in spite of long erperience) a matter of anxiety to those responsible, was naturally, in the case of such a vessel, an undertaking of unusual importance. The method of launching, however, was one of the simplest imaginable, the vessel being held on the ways by hydraulic triggers only requiring to be released by the opening of a valve in order to let the vast structure glide into the water.

Besides being the largest and heaviest vessel ever launched, the "Olympic" is undoubtedly also the strongest. Both in design and workmanship this has been kept in view, and the most approved structural arrangements suggested by the ripest experience have been adopted, and every mechanical device requisitioned to secure this end. Never before in the history of shipbuilding have such elaborate means been employed, or such a combination of science, invention and skill in the production of a ship; nothing has been left to chance; everything has been carefully thought out and skillfully planned, down to the most minute details, and from keel to truck the "Olympic" will be as perfect as human ingenuity and skill and the most powerful appliances can make a vessel. The double bottom, extending the whole length of the vessel, 5 ft. 3 in. deep (increased under the reciprocating engine room to 6 ft. 3 in), the massive beams and close framing, the large shell plates, the steel decks and watertight bulkheads combine to make a structure of exceptional strength and rigidity. The hydraulic riveting in the vessel is also an important factor, the whole of the shell plating up to the turn of the bilge being riveted by hydraulic power, and an immense amount of this riveting having also been carried out in other parts of the vessel—shell, top sides, decks, stringers, etc. The rivets were closed by means of the powerful 7-ton riveting machines suspended from the traveling frames on the gantry; and while making the sound, tight connection so essential in this mighty hull, the rivets studding the shell plating present a



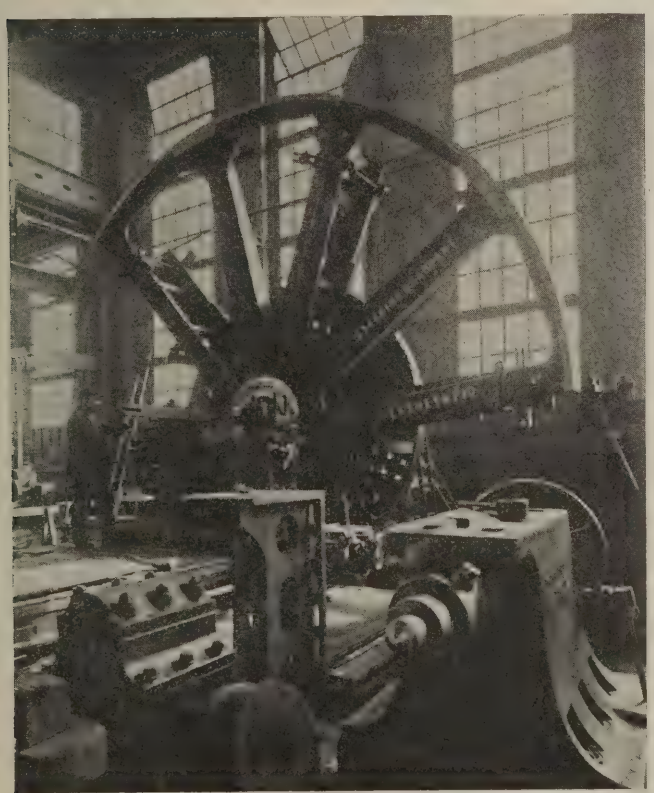
LAUNCHING THE OLYMPIC.

THE OLYMPIC, TAKEN IMMEDIATELY AFTER LAUNCHING.

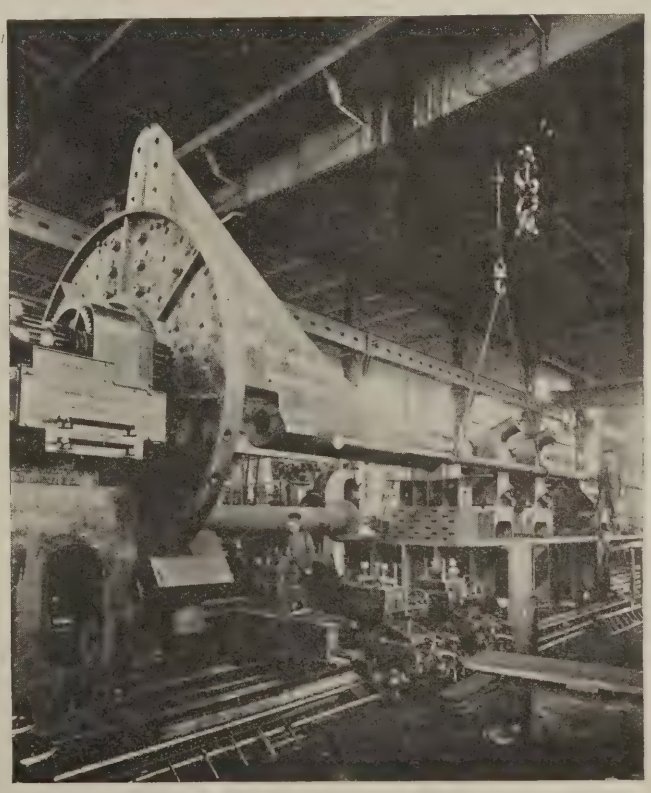
very pleasing and symmetrical appearance. As illustrating the importance of the riveting in this vessel, there are half a million rivets in the double bottom alone, weighing about 270 tons, the largest rivets being 1¼ in. in diameter; and in the complete ship there will be something like three millions, weighing about 1,200 tons.

The following particulars will also be found interesting: The largest shell plates are 36 ft. long, weighing 4¼ tons each; the largest beam 92 ft. long, the weight of the double beam being 4 tons; the stern frame weighs 70 tons; the after boss arms 73½ tons, the forward 45 tons; the rudder 100 tons; the engine crank shafts 118 tons each; bedplate 195 tons; columns 21 tons each; the heaviest cylinder, with liner, 50 tons; wing propellers each 38 tons—finished weights. The castings for the turbine cylinder weighed 163 tons, and for the center (turbine) propeller, which is of solid bronze, 22 tons.

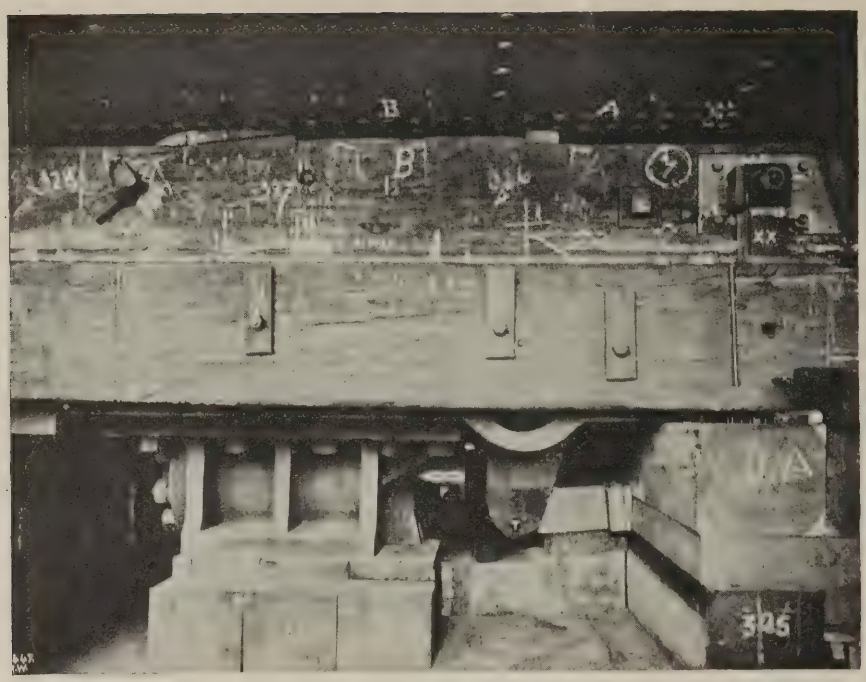
For checking the vessel after leaving the ways, three heavy anchors were placed in the bed of the river on each side of the ship, each anchor being connected by a 7-inch steel-wire hawser to eyeplates riveted to the shell plating. There were also placed in the bed of the river two piles of cable drags, each weighing over 80 tons, connected in a similar manner with an 8-inch steel-wire hawser. These were all arranged so that when the vessel was nicely clear of the end of the slip the drags and anchors acted simultaneously in bringing the



STEERING QUADRANT S. S. OLYMPIC.



RUDDER HEAD OF S. S. OLYMPIC IN LATHE.



HYDRAULIC LAUNCHING TRIGGER S. S. OLYMPIC.

ship to a standstill. As a further precaution the ship's own bow anchors were stowed in the hawse pipes, ready for letting go in case of emergency. So effectual were these methods, that from the time the triggers were released, allowing the vessel to move, until the "Olympic" was stationary in the water, less than two minutes elapsed.

As already announced, the machinery decided on for the "Olympic" and her sister ship "Titanic" is the combination of reciprocating engines with a low pressure turbine, so successfully adopted in the White Star Canadian liner "Laurentic," this arrangement having proved the most satisfactory from an engineering point of view. As there will be accommodations for about 2,500 passengers in all, besides a crew of 860, this arrangemennt is in keeping with the well-known practice of the White Star Line in making the comfort and safety of the passengers their first care. Full advantage is being taken of the enormous size and spaciousness of the vessel to excel anything hitherto attempted, both in the public rooms and private cabins; and the entrances, the magnificent staircases and other features will be on a scale of unrivaled magnitude and excellence, to say nothing of such items as the swimming bath, gymnasium, palm court, etc.

A New Boat Detaching Device

A new detachable shackle which may be used for lashing a life boat in the chocks or cradles as well as for releasing the falls, has been invented by John T. Kinney, Buffalo, N. Y., and is illustrated in the line engravings herewith. Essentially it consists of a hook with an elongated bill combined with a tripping device which is carried by a ring in the eye of the lower block or in the lower end of the gunwale hooks.

The first step in the operation of launching a life boat is necessarily the casting adrift of the lashings by which the boat is secured in the chocks. Figs. 1 and 2 show the manner in which the Kinney detachable hook is applied for this purpose. By leading the tripping lanyards of all four lashings to a common point all can be cast off simultaneously and in casting off the boat falls both can be let go at the same instant, a matter of no small importance in launching in a seaway, and it is not necessary that the strain shall be entirely off the shackles in order to do so, a condition essential to the operation of

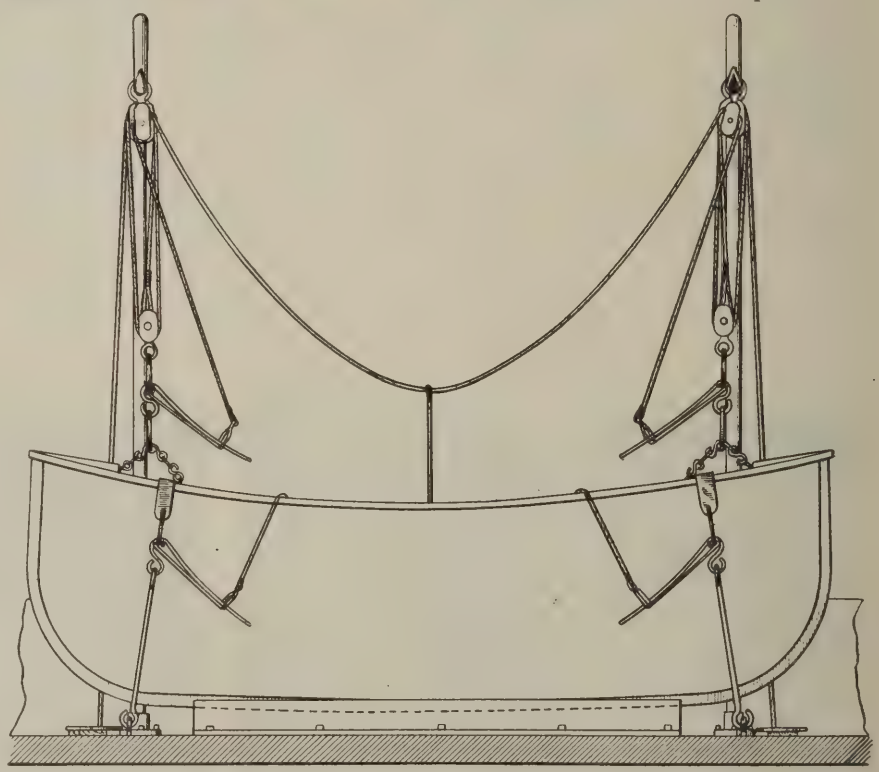


FIG. 1.

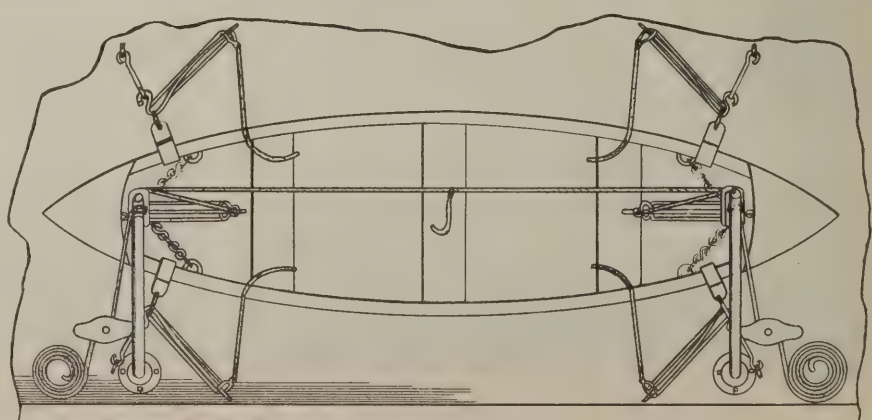


FIG. 2.

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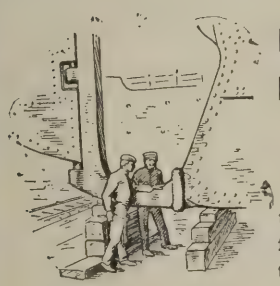

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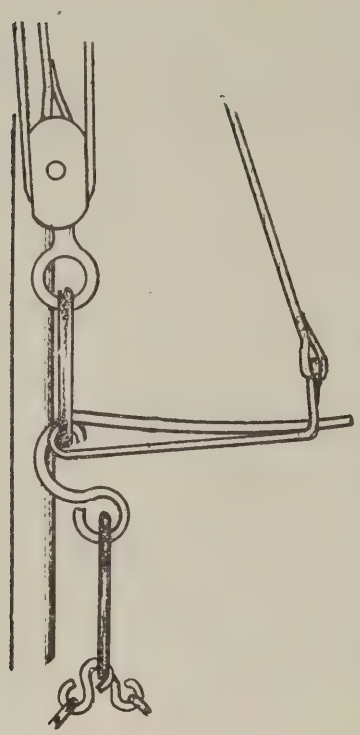


FIG. 3.

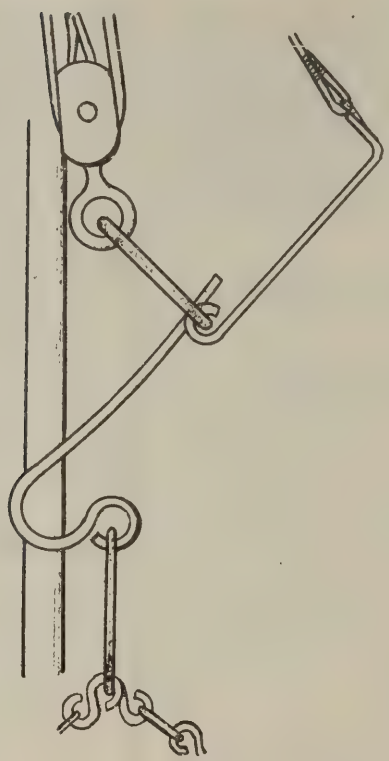


FIG. 4.

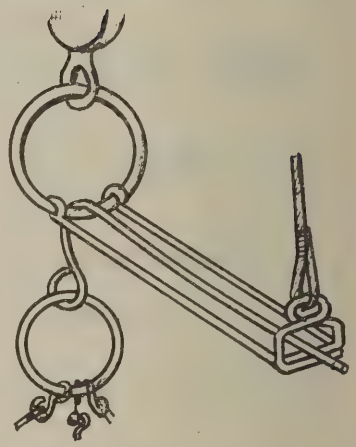


FIG. 5.

most boat detaching devices. The lanyard controlling the detaching device can either be taken overboard with the boat or be retained on board as preferred or as may be necessary, in which respect this device differs from all others. The device can be released in 20 seconds.

Figs. 3 and 4 in connection with Fig. 1 show plainly the method of operation. One of the strong points in connection with this device is that its operation is not liable to be interfered with by snow or ice because, as will be readily understood, even though it should be iced up, it is of such a form that a slight rap will readily restore it to condition for immediate action. The construction of the device is plainly shown in Fig. 5, from which it will be noted that wrought iron and steel rod is used throughout.

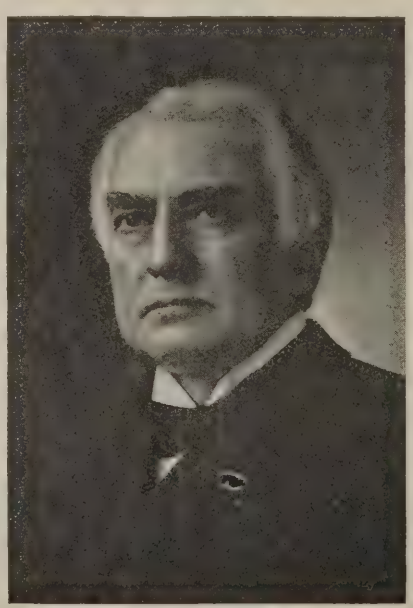
The device is being manufactured by Kinney Bros., 150 O'Connell avenue, Buffalo, N. Y.

New Law Firm

Messrs. S. H. Holding and F. S. Masten, who retired from the firm of Goulder, Holding & Masten on Oct. 15, have formed a partnership under the firm name of Holding, Masten, Duncan & Leckie, with offices in the new wing of the Rockefeller building. As noted elsewhere, Mr. Goulder continues business in the old offices. Messrs. Duncan and Leckie were former employes of the old firm.

Mr. Holding was born in Philadelphia in 1858. He studied law in the office of the Hon. Daniel Dougherty and was admitted to the bar on March 9, 1880. He came west during that year and entered the legal department of the old Bee Line railway, serving as assistant general attorney until 1886, when he resigned and went to Cincinnati, forming a partnership with C. B. Matthews, brother of Judge Stanley Matthews of the United States supreme court. He entered the legal department of the Big Four railway as assistant general attorney in 1887 and was with that railway until 1893, when he resigned and came to Cleveland. In January, 1893, he associated himself with Mr. Goulder under the firm name of Goulder & Holding, but continued to try cases for the Big Four throughout Ohio. He continued his association with Mr. Goulder until the present year, though the firm name had changed as new partners were admitted. Mr. Holding is the president of the Civil Service Commission, the only public office he has ever held.

F. S. Masten was born in Mahoning county, O., in 1865. He graduated from the Northeastern Ohio Normal college in 1885, and studied law in the legal department of the Big Four railway under the direction of H. H. Poppleton and S. H. Holding. He was admitted to the bar in 1893 and re-



S. H. HOLDING.

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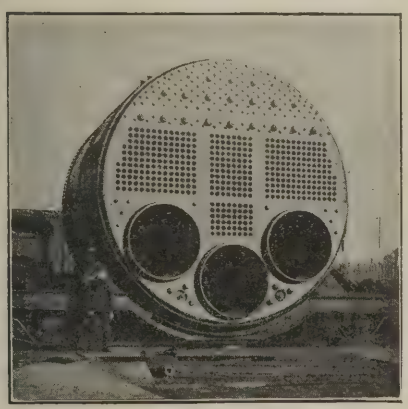

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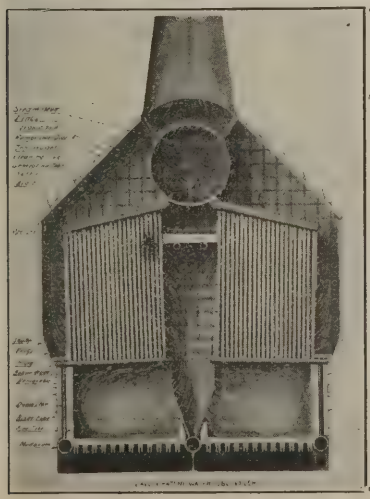

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CATALOGUE AND PRICES ON APPLICATION

T. H. DUNCAN.

F. L. LECKIE.

mained in the office of the Big Four railway until the fall of 1893, when he entered Goulder & Holding's office as law clerk, later being admitted to partnership. He is a member of the Colonial and Rowfant clubs, is a Mason, having attained the thirty-second degree of the Scottish rite, is a Mystic Shriner and a member of the Royal Order of Scotland.

Tracy H. Duncan was born in Toledo, though he has lived in Cleveland pracically all his life. He graduated from the Western Reserve college and law school in 1903 and he is instructor in marine fire and life insurance at the Western Reserve university law school.

Frederick L. Leckie is a native of Port Huron, Mich. After graduating from the high school he sailed for a number of years, passing through the various grades of sailing and has held a master's license ever since he was 21 years old. He is a veteran of the Spanish-American war, having served in the regular army during the Porto Rican campaign. He is treasurer of the Ship Master's Lodge of Cleveland.

Pacific Coast Coal Test

It was expected that the comparative test of eastern and western coals would begin the first of the coming month, but it has been found necessary to postpone that event until early in December, when the Maryland and West Virginia shall have completed their target practice. The naval collier Saturn has been loaded with 800 tons each of three prominent state of Washington coals and is already in San Francisco bay awaiting the availability of the two vessels of the Pacific fleet which have been assigned to this duty. The test will be conducted with a view to obtaining information for the guidance of the Navy department in the matter of coal obtained on the west coast. Representations have been repeatedly made to the navy department that fuel from that source is equal to the coal which is purchased from eastern mines, in which event, of course, there will be an appreciable saving in transportation. There has been, on the other hand, considerable doubt as to the suitability of the western product as compared with eastern coal for naval use, where it is desired to obtain the greatest steaming efficiency. The naval authorities would be much gratified if the test is conclusive, since the comparison along identical lines, such as is contemplated, will undoubtedly dispose of a vexatious controversy, which survives through succeeding administrations, an effort stimulated by the prospect of an enlarged market. It is planned to have the Maryland use the western coal, while the West Virginia will burn the eastern coal, proceeding on the cruise together in order that there may be identical conditions as to distance and weather. On the trip from Seattle to San Francisco the Saturn burned one of the Seattle brands of coal. It did not prove entirely satisfactory, according to the unofficial report which has been made of the incident.—*Army and Navy Register.*

The publication of the above paragraph drew the following reply from George F. Thorndyke.

Editor *Army and Navy Register:*—

My attention has been called to an article appearing in your issue of Oct. 22, entitled "Pacific Coast Coal Test."

The statements made therein, according to the best knowledge I have compels me to conclude that the *Register* partially misrepresented the facts.

The writer believes himself to be the first to have made complaint because of the navy department's policy in transporting Pocahontas coal to this coast in foreign tramps, dismissing those ships from its service on the Pacific coast, where they so competed with the business of the American owned vessels here that their business was demoralized.

My first utterance in remonstrance was contained in a letter addressed to Beekman Winthrop, acting secretary of the navy, in 1908, wherein I plainly represented the facts by stating to him that there was sufficient, efficient coal mined on this coast to enable the navy department, by its use, to produce practical results. That I was entirely within the truth when I made that statement is a certainty; my authority is unquestionable.

I am confident that records neither in the navy department, nor elsewhere, will show that anyone from the Pacific coast represented that coal mined here would equal in efficiency the Pocahontas, or any other preferable Atlantic coast coal.

It was stated to Mr. Winthrop that the Comox, B. C. coal, when tested at the Bremerton navy yard, a few years ago, lacked but 6 per cent of being as efficient as is the Pocahontas coal. I stated that some of the coal mined on the American side on this coast was customarily used in vessels of the Pacific Mail Steamship Co., United States army transports, and United States revenue cutters operating to Bering Sea, thought to be the most dangerous navigable body of water in the world. Other ships, required to maintain sea steaming equal to 17 and 18 knots daily, successfully use our coal. No one has attempted to disprove these statements and it would be asinine to do so.

The navy department, through an acting secretary, did promise to make several tests of Pacific coast coal, commencing in November next. In confirmation of that promise there were some 2,700 tons of King county coal loaded on board the collier Saturn and transported to San Francisco, for the purpose of making the test. It was understood that the Saturn was to consume 300 tons of the coal loaded, as a side test; the balance was to be consumed by the cruiser Maryland. The navy department has failed us before with regard to this fuel proposition, so we now feel that there is no intention to make a fair test of the Pacific coast coal. We want no stronger reason for arriving at that conclusion than to know that the navy department intends to keep our soft bituminous coal in storage in excess of sixty days before consumption. The reason for that we quite well understand.

We have now given up hopes that a fair test will be made and doubt if a test of any kind is made. We feel confident the postponement of the tests until December was made as an excuse to enable the department to ship another consignment of Pocahontas coal to this coast about the first of the year 1911. We are constrained to believe this, because a little over a year ago an authoritative official of the navy department stated, when in Seattle, that it was then the expectation of the navy department to use naval colliers to some extent in handling Atlantic coal to the Pacific coast, and that he hoped that policy would be adopted before it became necessary to place contracts for coal about January 1, 1910, a promise never kept, nor probably intended to be kept.

As regards the kind of coal bought and shipped on the Saturn to make the test: For your information would

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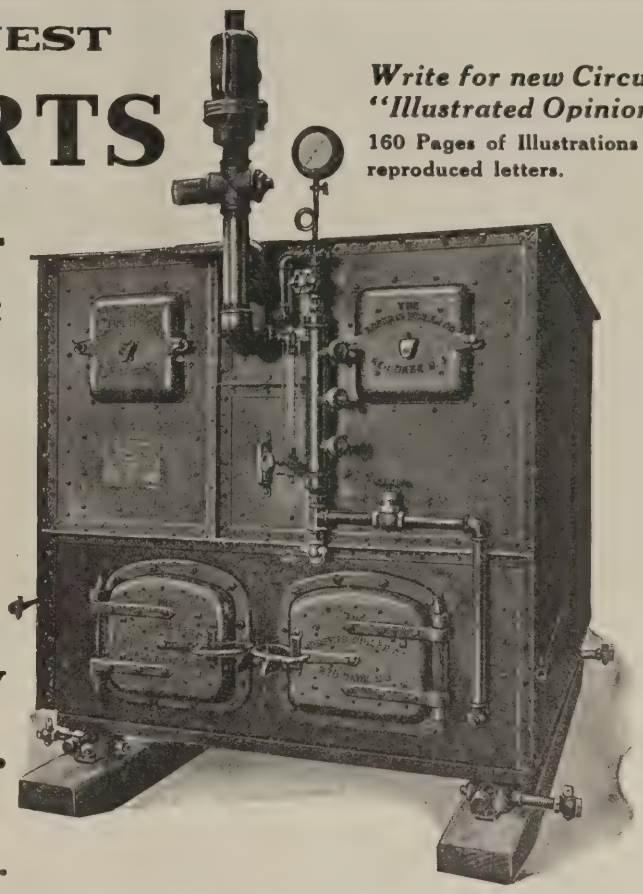

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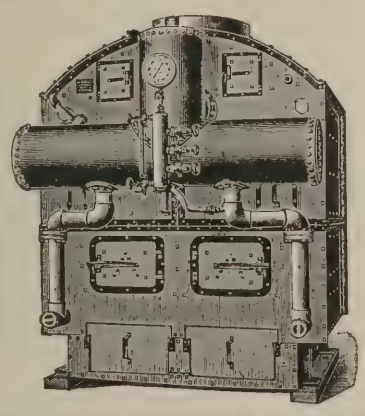

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It is apparent that a sufficient effort was not made to exclude from the test such coals as were without reputation as a marine fuel, which could easily have been arranged through our commercial bodies in Seattle.

That ships of the old white squadron did customarily use Pacific coast coal is unquestionable.

That the battleship Oregon made her best record when consuming Pacific coast coal incident to her famous voyage from the Pacific to the Atlantic is unquestionable.

That the French cruiser Montcalm recently secured very good results from Seattle coal, which fuel was afterwards complimented by her chief engineer, is unquestionable.*

That two Japanese cruisers burned quantities of Seattle coal during 1909, and obtained satisfactory results, is unquestionable.

That the navy department declines to purchase Comox, B. C., coal because it is mined without the United States, which coal could be bought for about $4 per ton, yet the department has for three years chartered hundreds of thousands of tons of foreign ships at more than that figure per ton to transport Atlantic coal to this coast is unquestionable. All employes on these tramps are aliens and often times Asiatics.

That Comox, B. C., coal is mined in territory contiguous, and within close proximity to the United States; many of the miners employed in British Columbia mines are Americans; much of the corporate investment is American, and that said coal is distributed in this country by an American company is unquestionable.

The present proposed test is unnecessary, and unwarranted, because the department has abundant evidence of the practicability of Pacific coal. That we whose business has been demoralized by the department's policy are within the spirit of right when we seek remedial legislation is unquestionable.

The Pacific coast is now completely aroused on the question of supplying fuel to the Pacific cruiser fleet, but we are about to end our negotiations with the navy department, and have concluded there is but one way to solve this question, and that is to take it out of the hands of the navy department officials by the enactment of a law preventing the present shipments of Atlantic coast coal to the Pacific in foreign vessels.

Yours very truly,
(Signed) G. F. THORNDYKE.

THE MARINE REVIEW long since foreshadowed the action of the department with regard to Pacific coast coal. There is no desire nor intention to conduct impartial investigation into this question. The reasons given for using Eastern coals are not the truth and will not bear the light.

The department says that Alaskan coal when available will probably be satisfactory. It will if the proper parties get control of it. Some high naval authorities, including Admiral Evans, of noisy fame, profess to believe that the Pacific will be the theater of our naval activities; if they are right what in the name of Heaven will our ships do if they are dependent on eastern fuel? Will it be a convenient excuse for keeping all snug (and safe) in port?

*See October MARINE REVIEW.

Accidents to Lake Vessels

Altogether 45 accidents occurred to lake vessels during October. The most important loss, of course, was that of the steamer W. C. Moreland, owned by Jones & Laughlin, of Pittsburg, and managed by W. H. Becker, of Cleveland, which stranded on the rocks at Eagle Harbor, Lake Superior, on Oct. 18, with a cargo of 10,700 tons of ore. The Moreland came out only last September, having been built at the Lorain yard of the American Ship Building Co., and was regarded as one of the finest freighters on the lakes. The particular location where she fetched up is one of the most dangerous on the lakes, owing to its exposed position. Heavy weather prevented the wreckers from working on her steadily and she was finally abandoned to the underwriters. The latest report says that the Moreland is broken into three parts of nearly equal length. There are two breaks in the hull at Nos. 12 and 24 hatches which extend below the tank top and in order to recover her it will be necessary to bulkhead both sides of each break. About all that is really worth saving is the after hold with machinery and boilers. The probability is that the Moreland will be completely destroyed, entailing a loss to the underwriters on hull, cargo and wrecking cost of about $500,000. The Reid Wrecking Co. has the contract to salve her.

The package freight steamer Wasaga was burned to the water's edge at Copper Harbor on Sunday, Nov. 6. She had a cargo of general merchandise and was bound for the head of the lakes. Her cargo, which was valued at $56,000, was insured.

The steamers Martin Mullen and James H. Reed were in collision in St. Clair river. Both vessels were quite badly damaged, the Mullen later docking at Superior and the Reed at Lorain.

The steamer C. W. Kotcher stranded at the Limekiln Crossing, Detroit river, and had to lighter 1,200 tons of her coal cargo. She practically blocked the channel during the night time, as no vessels were permitted to pass. In the day time vessels could pass with the aid of tugs.

There were four total losses, the Lycoming, which was destroyed by fire at Rondeau; the Langham, which was burned off Keweenaw Point, Lake Superior; the Wasaga, as mentioned, and the Moreland. The usual table of accidents is withheld for a month.

Commerce of Sault Canal

The commerce of the Sault canal for October amounted to 7,868,793 tons, showing a falling off as compared with the commerce of any of the preceding months of the present year. This, of course, was to be expected, as the ore slump was quite drastic during October. The commerce to Nov. 1, however, totals 56,705,967 tons, as against 48,166,688 tons for the corresponding period last year, an increase of 8,539,279 tons. Following is the summary:

	To Nov.1, 1909.	To Nov. 1, 1910.
EAST BOUND.		
Copper, net tons	94,230	115,373
Grain, other than wheat, bush.	26,311,621	29,849,662
Building stone, net tons	1,674	9,485
Flour, bbl.	5,162,355	6,114,481
Iron ore, net tons	34,395,380	39,006,737
Iron, pig, net tons	30,663	31,728
Lumber, M. ft. B. M.	484,412	544,886
Wheat, bush.	69,048,988	62,296,174
Unclassified freight, net tons	128,797	142,455
Passengers, number	29,011	30,955
WEST BOUND.		
Coal, anthracite, net tons.	1,106,097	1,411,345
Coal, bituminous, net tons.	7,210,733	10,549,041
Flour, bbl.	3,700	1,110
Grain, bush.	5,750	2,153
Manufactured iron, net tons	376,931	328,253
Iron ore, net tons	15,573	3,248
Salt, bbl.	531,065	483,529
Unclassified freight, net tons	771,169	1,053,708
Passengers, number	29,823	33,944
SUMMARY OF TOTAL MOVEMENT.		
East bound, net tons	38,606,780	43,288,425
West bound, net tons	9,559,908	13,417,542
Total	48,166,688	56,705,967

The total number of passages to Nov. 1, 1910, was 18,825, and the net registered tonnage, 45,746,345.

Personal

The firm of Nacey & Hynd, marine architects and consulting engineers, has been dissolved and both will continue in business independently hereafter. Mr. Hynd has opened an office at 872-874 Rockefeller building, Cleveland, while Mr. Nacey will for the present continue in business in the old office, at 208-209 Western Reserve building.

The Overman & Schrader Cordage Co., Covington, Ky., has recently issued a little catalog regarding their products. They make an extensive line and as regards manila rope are among the largest manufacturers in the country. They also carry an extensive line of commercial twines for the general trade.

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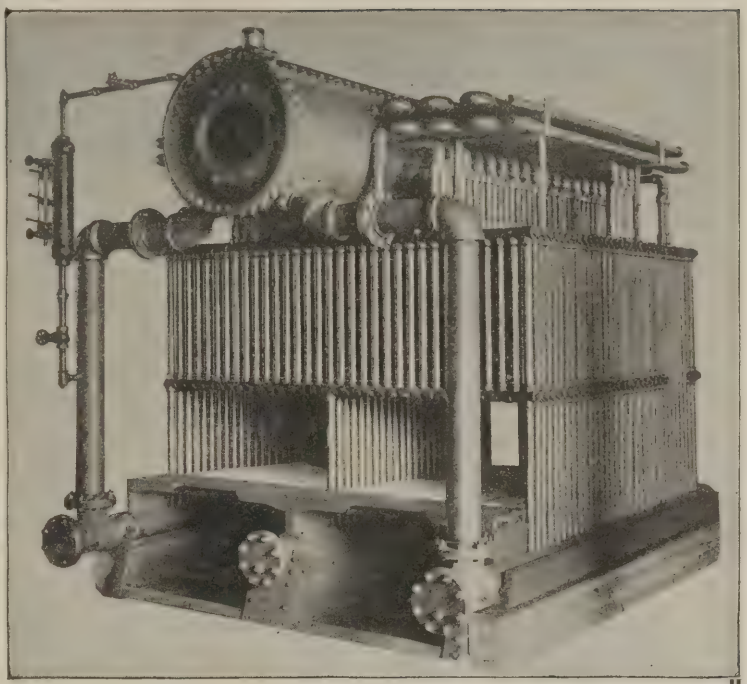

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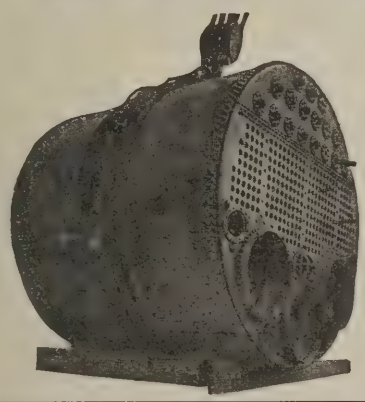

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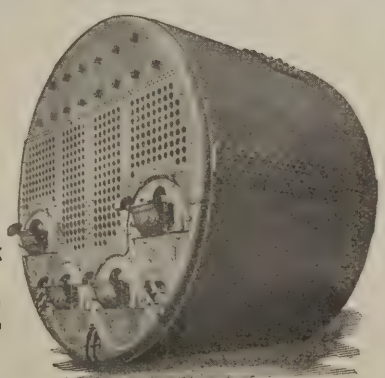

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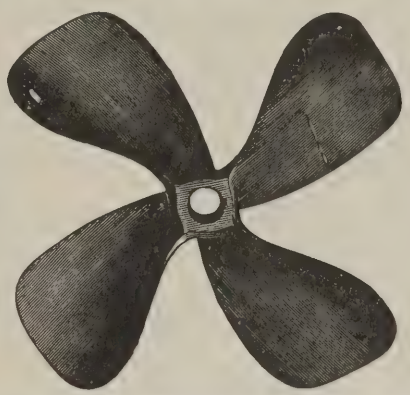

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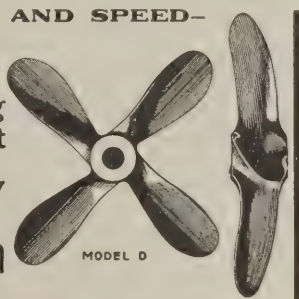

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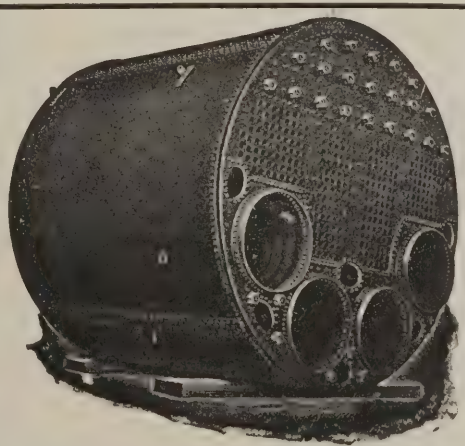

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Hayward Co., New York City.
Lidgerwood Mfg. Co., New York City.

DESIGNERS.

(Ship.)

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Curr, Robt., Cleveland, O.
Ekstrom, G., Detroit, Mich.
Furstenau, M. C., Philadelphia, Pa.
Kidd, Joseph, Duluth, Minn.
Nacey & Hynd, Cleveland, O.
Wood, W. J., Chicago, Ill.

DETACHING DEVICE.

(Boat.)

Kinney, John T., Buffalo, N. Y.

DIES.

Armstrong Mfg. Co., Bridgeport, Conn.

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Normand & Co., Cleveland, O.

DIVING APPARATUS.

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Schrader's Son, Inc., A., New York, N. Y.

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Detroit Ship Building Co., Detroit, Mich.
Great Lakes Engineering Wks., Detroit, Mich.

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(Wharf.)

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Ekstrom, G., Detroit, Mich.
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Hunt, Robt. W., & Co., Chicago, Ill.
Kidd, Joseph, Duluth, Minn.
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Nacey & Hynd, Cleveland, O.
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Todt, E. G., South Chicago, Ill.
Wood, W. J., Chicago, Ill.

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(Deck.)

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(Hoisting.)

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Lidgerwood Mfg. Co., New York, N. Y.
Williamson Brothers Co., Philadelphia, Pa.

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Bath Iron Works, Bath, Me.
Briggs, Marvin, New York, N. Y.
Chicago Ship Building Co., Chicago, Ill.
Chase Machine Co., Cleveland, O.
Clyde Ship Building & Eng'g. Co., Port Glasgow, Scotland.
Collingwood Ship Building Co., Collingwood, Ont.
Detroit Ship Building Co., Detroit, Mich.
Fletcher, W. & A., Co., Hoboken, N. J.
Fore River Ship Building Co., Quincy, Mass.
Gillett & Eaton, Lake City, Minn.
Great Lakes Engineering Wks., Detroit, Mich.
Johnston Bros., Ferrysburg, Mich.
Kingston Ship Building Co., Ltd., Kingston, Ont.
Manistee Iron Works Co., Manistee, Mich.
Manitowoc Ship Building & Dry Dock Co., Manitowoc, Wis.
Maryland Steel Co., Sparrow's Point, Md.
Milwaukee Dry Dock Co., Milwaukee, Wis.
Moran Co., Seattle, Wash.
Newport News Ship Building Co., Newport News, Va.
New York Ship Building Co., Camden, N. J.
Sheriffs Mfg. Co., Milwaukee, Wis.
Superior Ship Building Co., Superior, Wis.
Toledo Ship Building Co., Toledo, O.
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Lidgerwood Mfg. Co., New York City.
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(Hatch.)

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FITTINGS.

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Pickands, Mather & Co., Cleveland, O.
Pittsburg Coal Co., Cleveland, O.
Smith & Co., Stanley B., Detroit, Mich.

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(For Boilers.)

Ballin Water Tube Boiler Co., Portland, Ore.
Continental Iron Works, New York, N. Y.

GAGES.

(Water.)

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Michigan Lubricator Co., Detroit, Mich.
Penberthy Injector Co., Detroit, Mich.

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American Ship Windlass Co., Providence, R. I.
Chase Machine Co., Cleveland, O.
Dake Engine Co., Grand Haven, Mich.
Detroit Ship Building Co., Detroit, Mich.
Hyde Windlass Co., Bath, Me.
Sheriffs Mfg. Co., Milwaukee, Wis.
Standard Chain Co., Pittsburg, Pa.

GENERATORS.

General Electric Co., Schenectady, N. Y.

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(Lubricating.)

Dixon Crucible Co., Joseph, Jersey City, N. J.

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(Steam.)

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HAMMERS.

(Steam.)

Chase Machine Co., Cleveland, O.

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(Marine.)

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Lundin, A. P., New York City.
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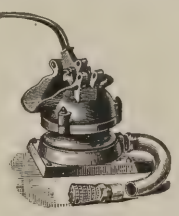

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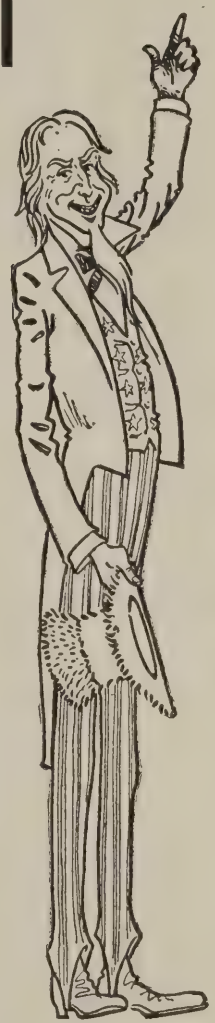

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Hayward Co., New York, N. Y.
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Williamson Brothers Co., Philadelphia, Pa.

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Roelker, H. B. New York, N. Y.

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Michigan Lubricator Co., Detroit, Mich.
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STOPPERS.
(Chain.)
American Ship Windlass Co., Providence, R. I.

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(Fire Department.)
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Nacey & Hynd, Cleveland, O.
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(Marine.)
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Erie Mill & Marine Supply Co., Buffalo, N. Y.
Griscom-Spencer Co., New York, N. Y.
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Kidd, Joseph, Duluth, Minn.
Nacey & Hynd, Cleveland, O.
Parker Bros. Co., Ltd., Detroit, Mich.
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SWITCHBOARDS.
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Hunt & Co., Robt. W., Chicago, Ill., and New York, N. Y.
Kidd, Joseph, Duluth, Minn.
Nacey & Hynd, Cleveland, O.
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(Steam.)
Jenkins Bros., New York City.
National Tube Co., Pittsburg, Pa.

TUBES.
National Tube Co., Pittsburg, Pa.

TUBING.
(Seamless.)
National Tube Co., Pittsburg, Pa.

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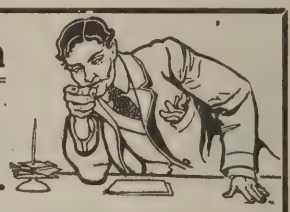

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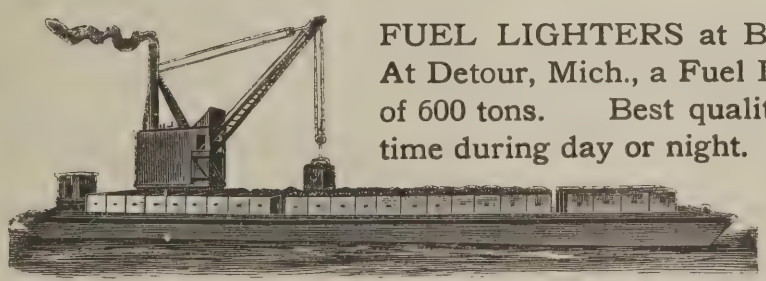

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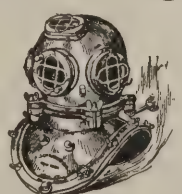

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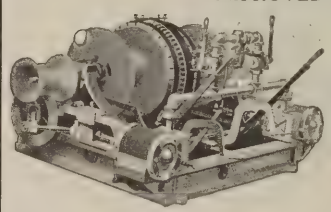

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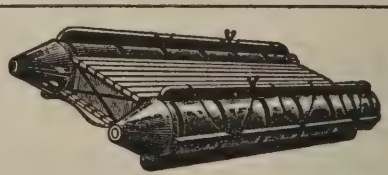

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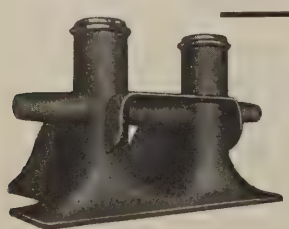

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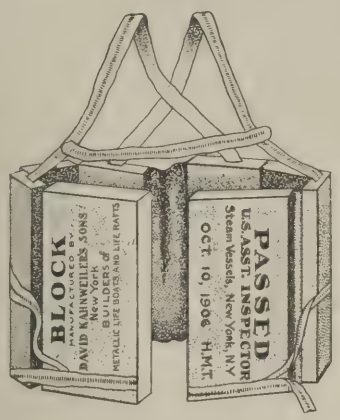

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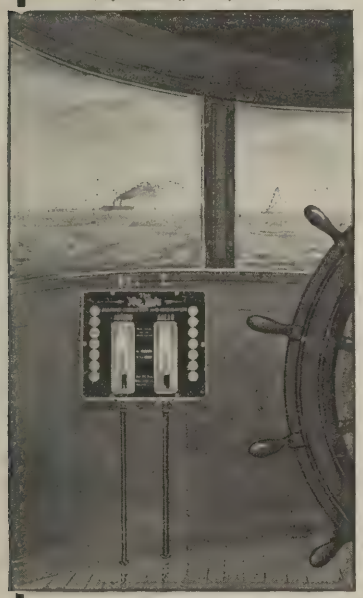

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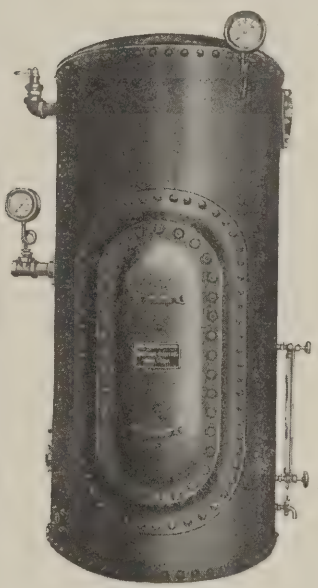

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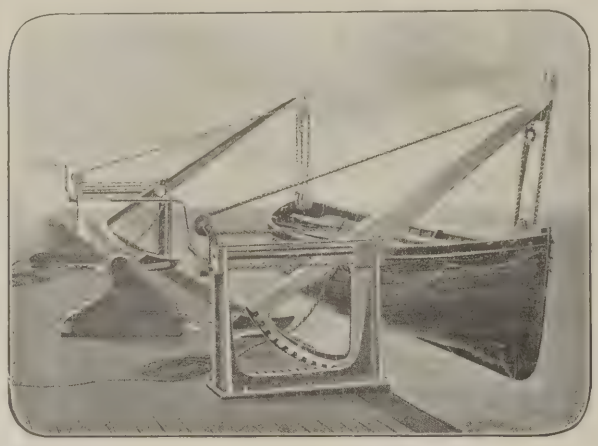

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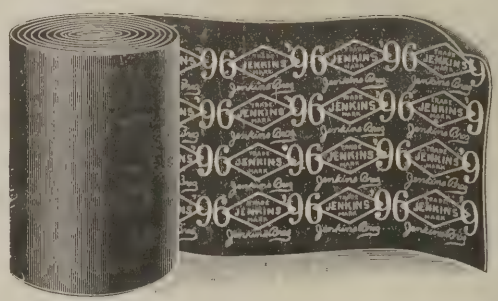

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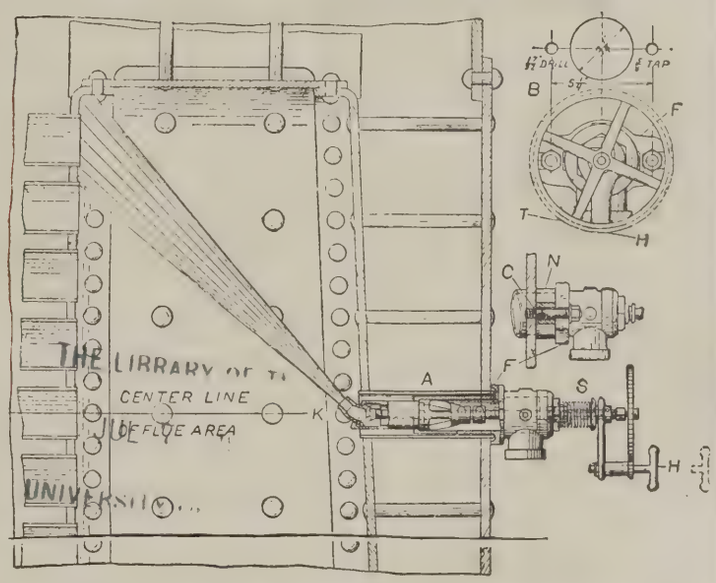

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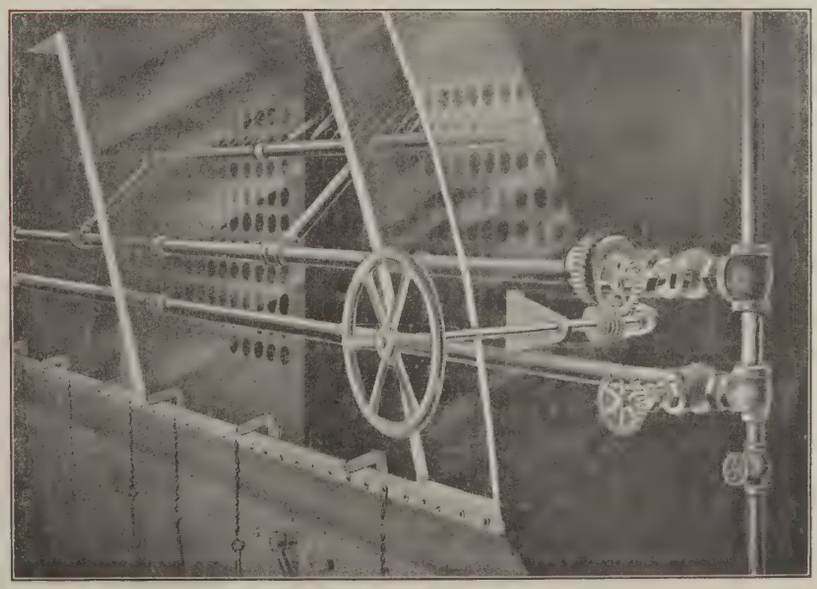

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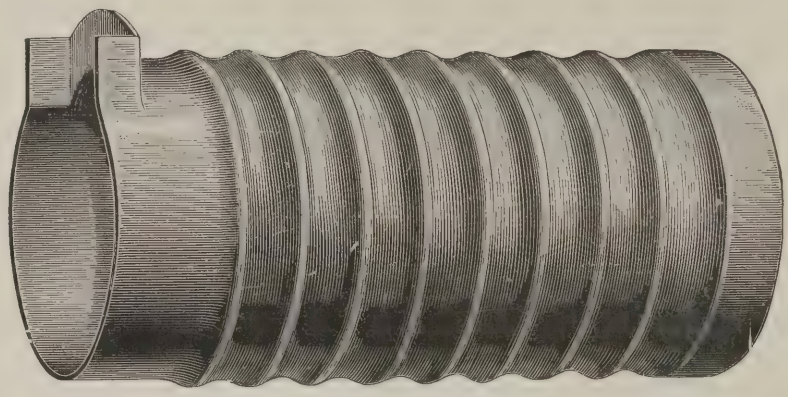

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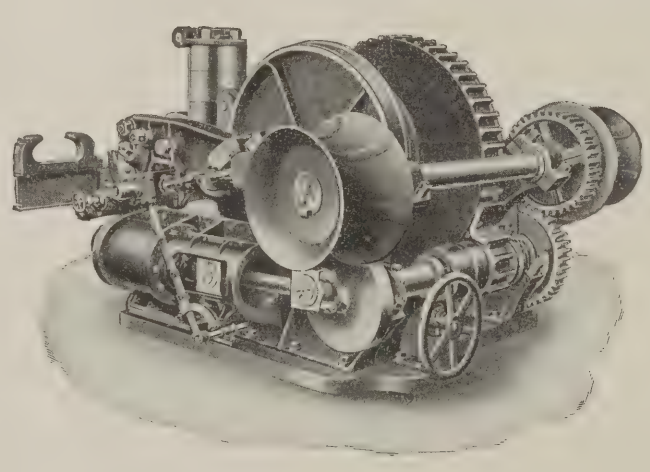

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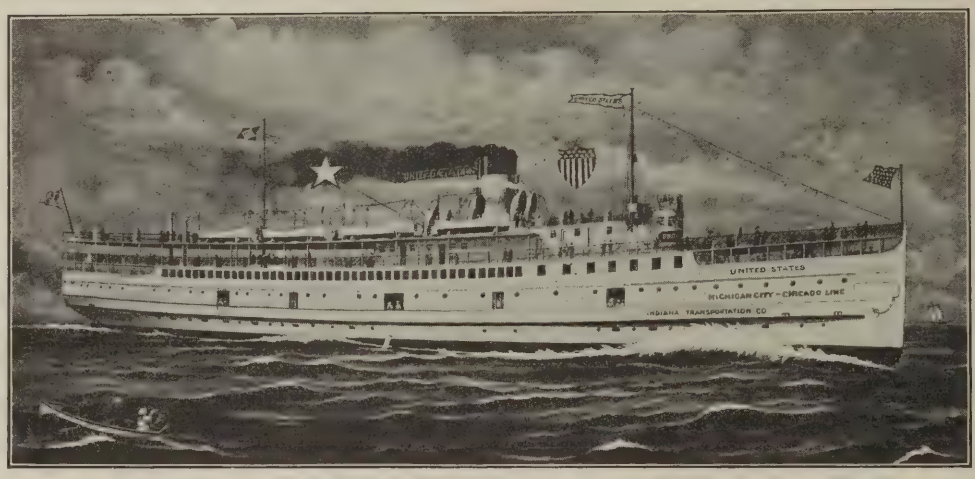

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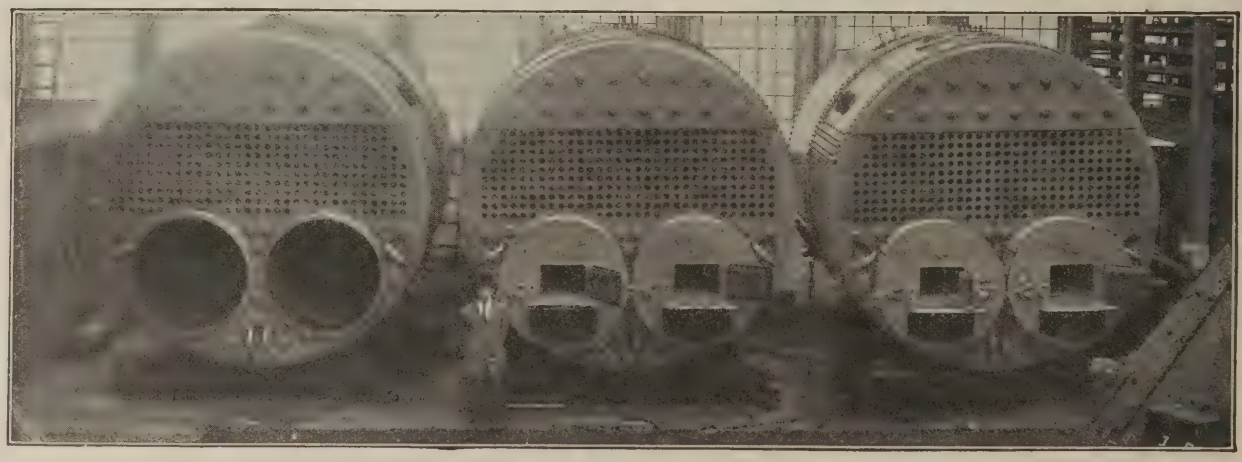

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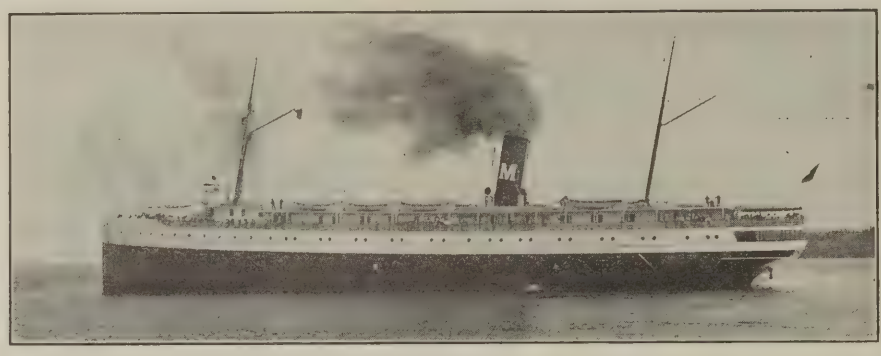

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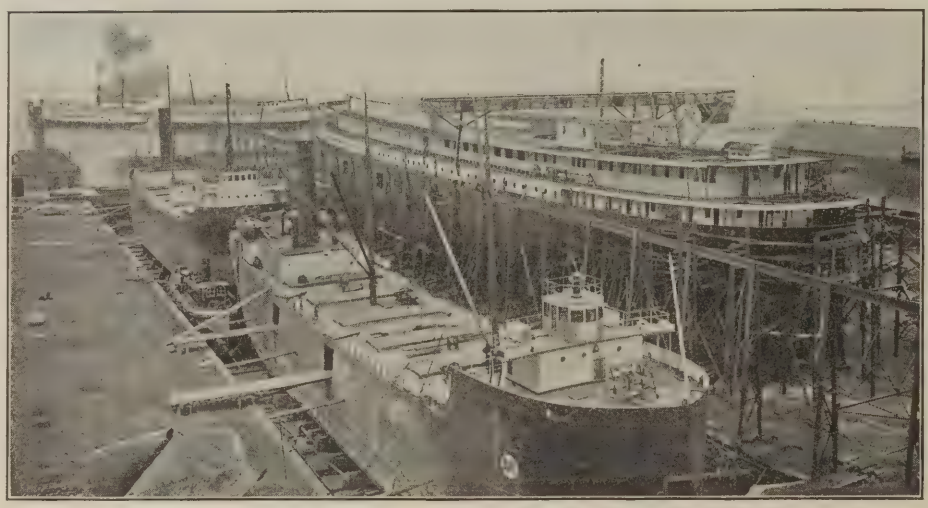

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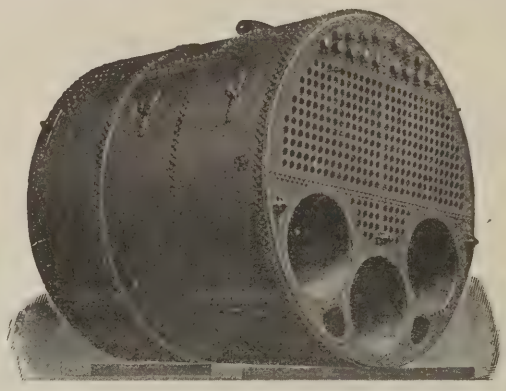

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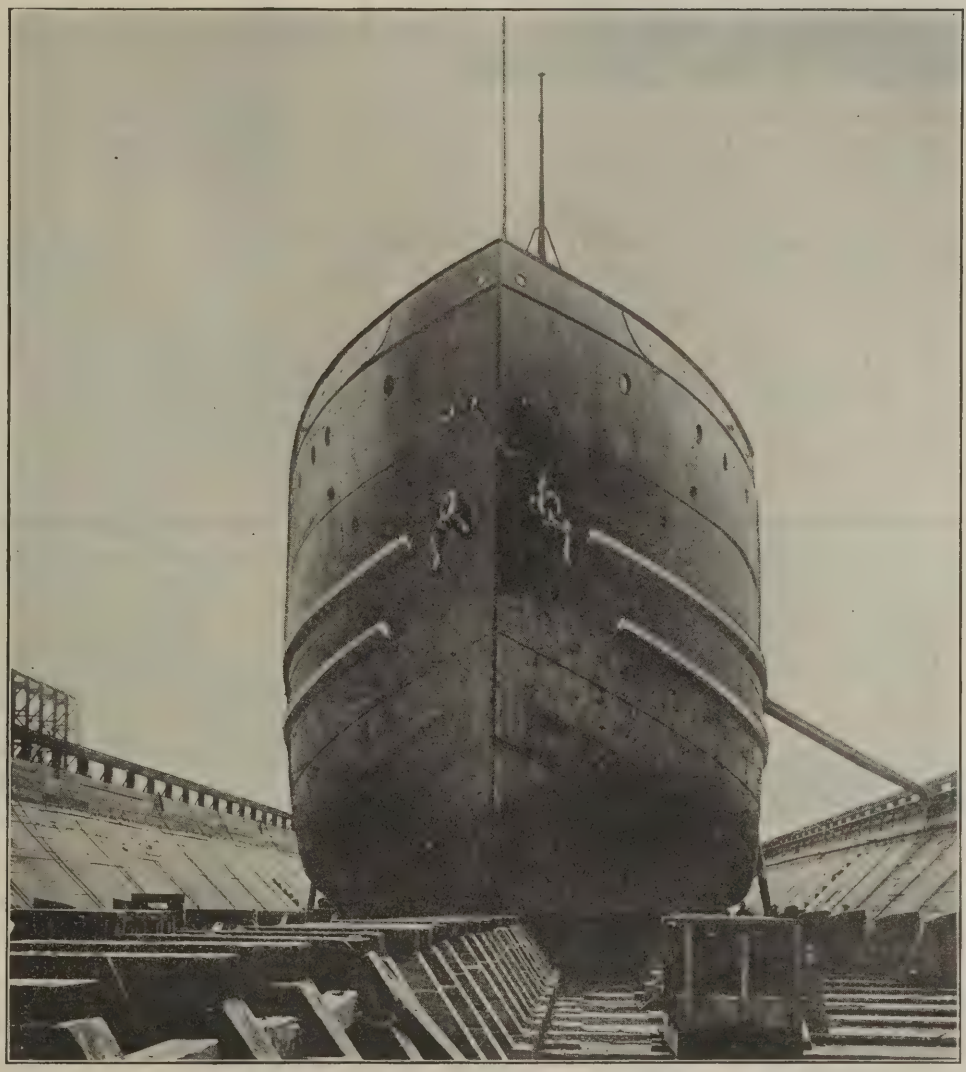

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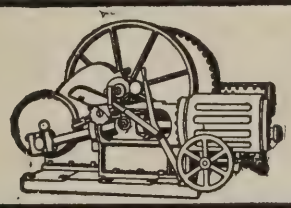
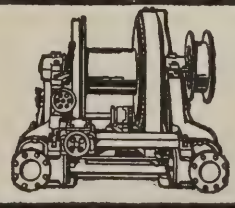
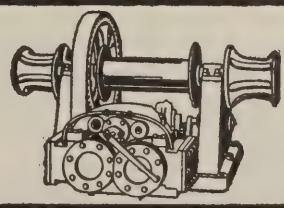

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Searchlight Projector, Illuminating Capitol at Albany, N. Y.

General Electric Searchlight Projectors

Wide Field of Usefulness.

G-E Searchlight Projectors meet the severe requirements of marine service—their widest application. They are extensively used on yachts, passenger steamers, dredges and merchant vessels of all kinds; for picking up buoys in the channel; for illuminating the scene of an accident, the scenery along the route, etc.

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G-E Searchlight Projectors are arranged for hand, pilot-house, rope or electric control.

General Electric Company

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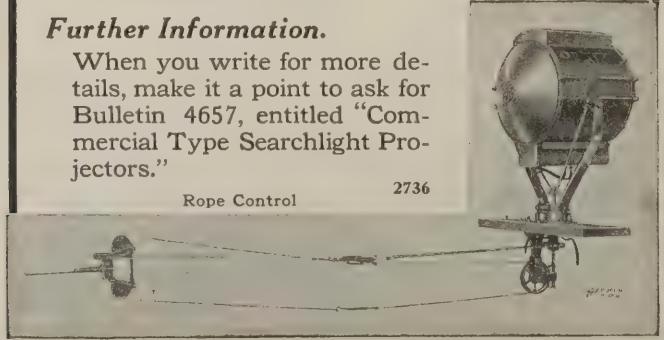
Further Information.

When you write for more details, make it a point to ask for Bulletin 4657, entitled "Commercial Type Searchlight Projectors."



Rope Control 2736

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(No. 6)*

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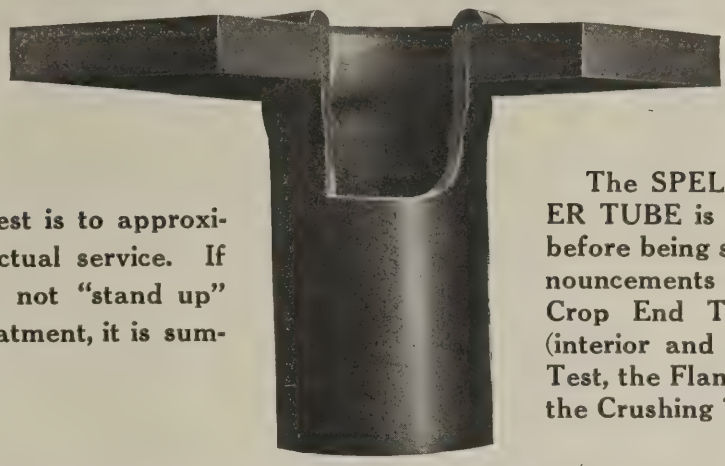
This is a severe treatment, wherein a SPELLERIZED STEEL BOILER TUBE is inserted in a section of tube sheet, in which a hole is drilled exactly similar to the flue sheet of a boiler.

The tube is then forced into the plate with a Prosser expander, flanged and beaded over.



The idea of this test is to approximate conditions of actual service. If the boiler tube does not "stand up" under this severe treatment, it is summarily rejected.

The SPELLERIZED STEEL BOILER TUBE is subjected to many tests before being sent out. In previous announcements we have described the Crop End Test, the Inspection Test (interior and exterior), the Hydraulic Test, the Flange Test, the Pin Test and the Crushing Test.

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*This is the sixth of a series of announcements in reference to the qualities of and tests given to SPELLERIZED STEEL BOILER TUBES

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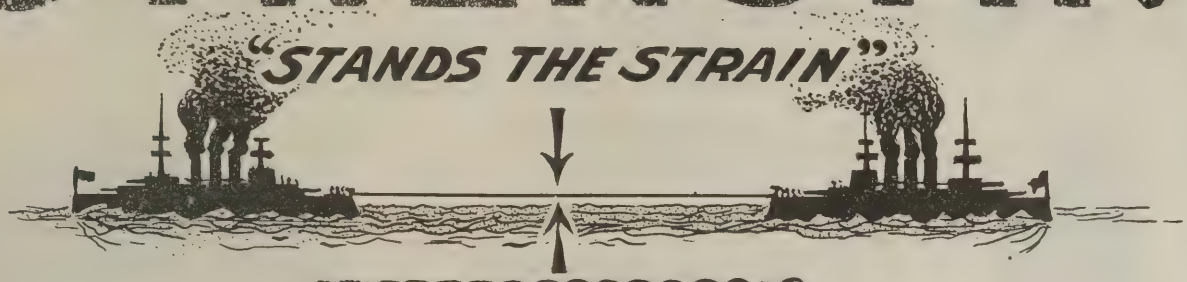
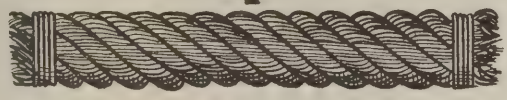


ESTABLISHED  1865

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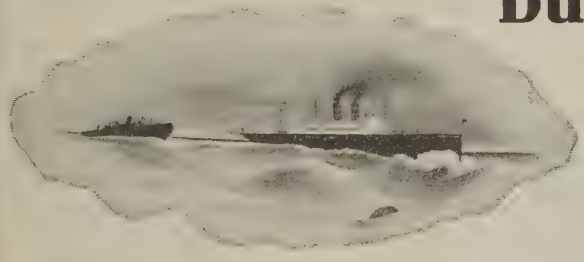

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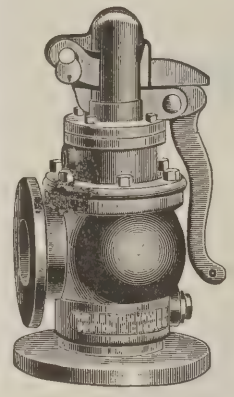

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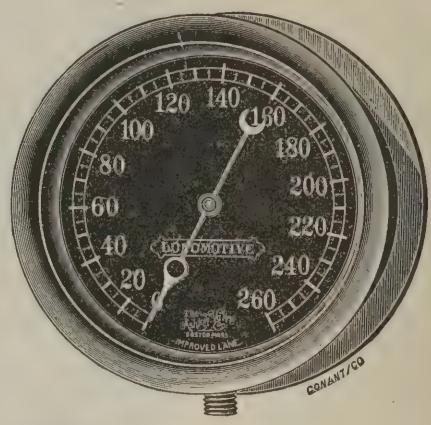

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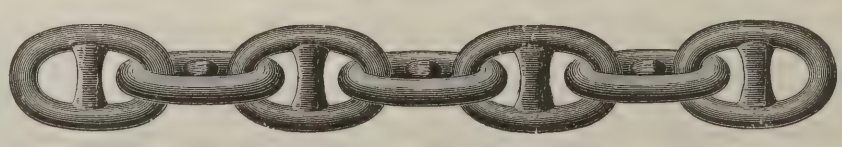

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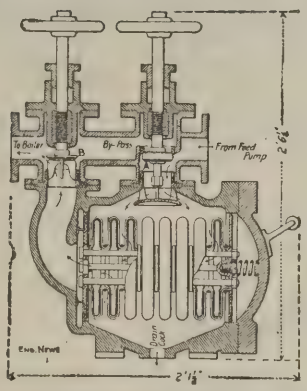

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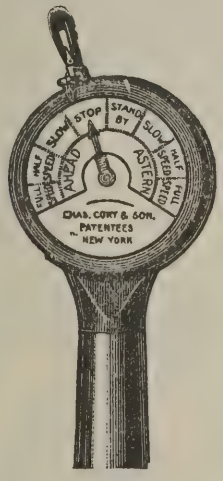

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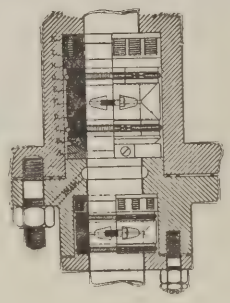

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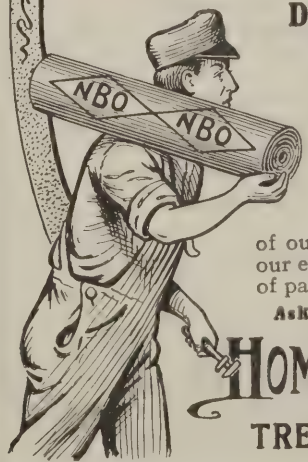

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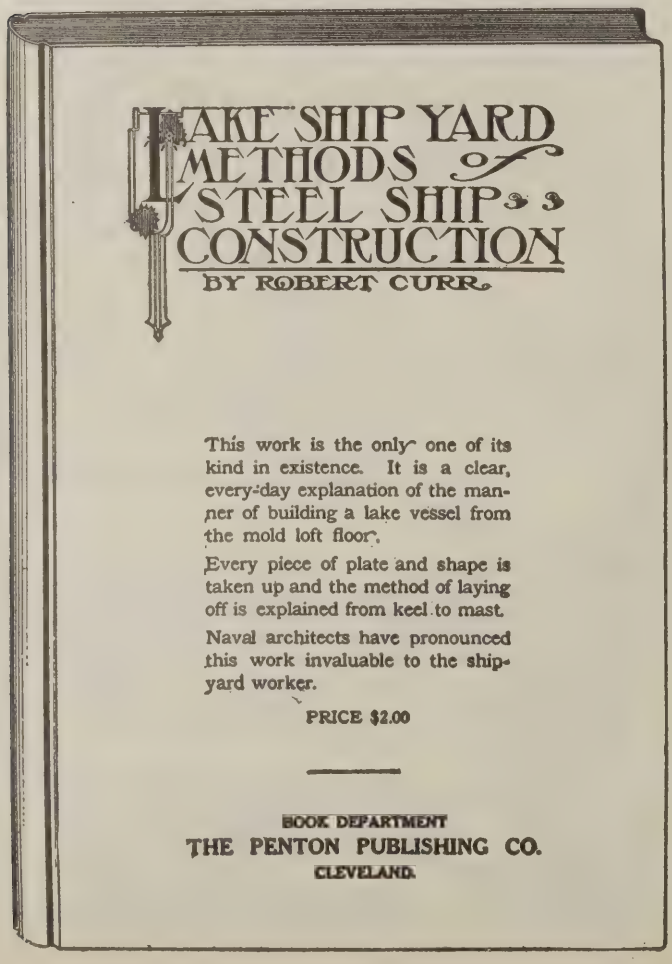

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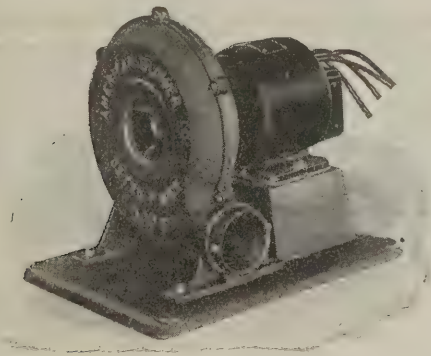

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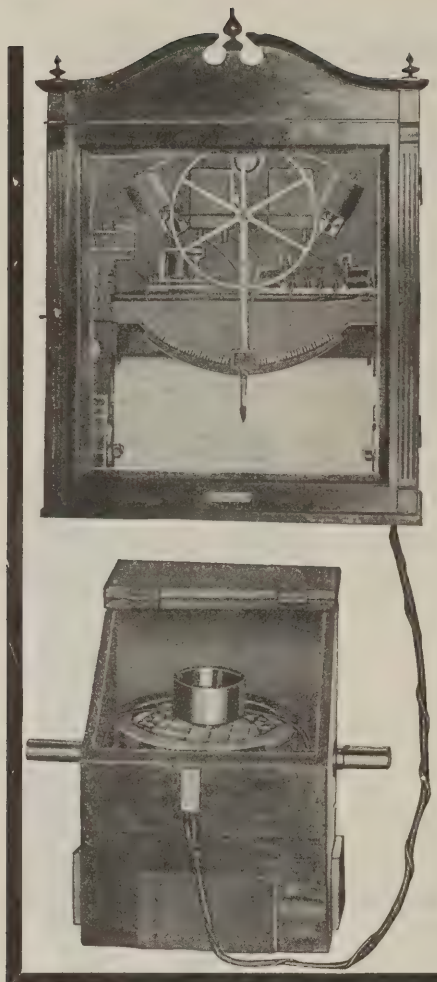

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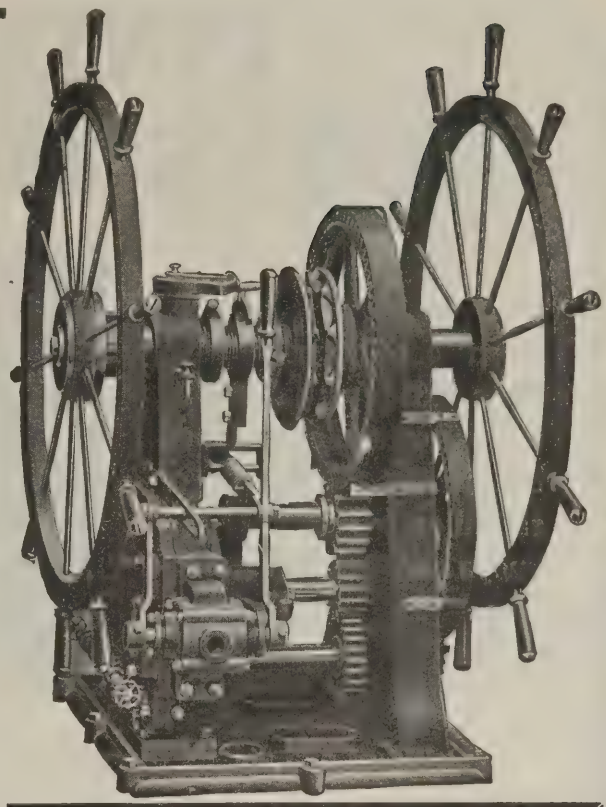

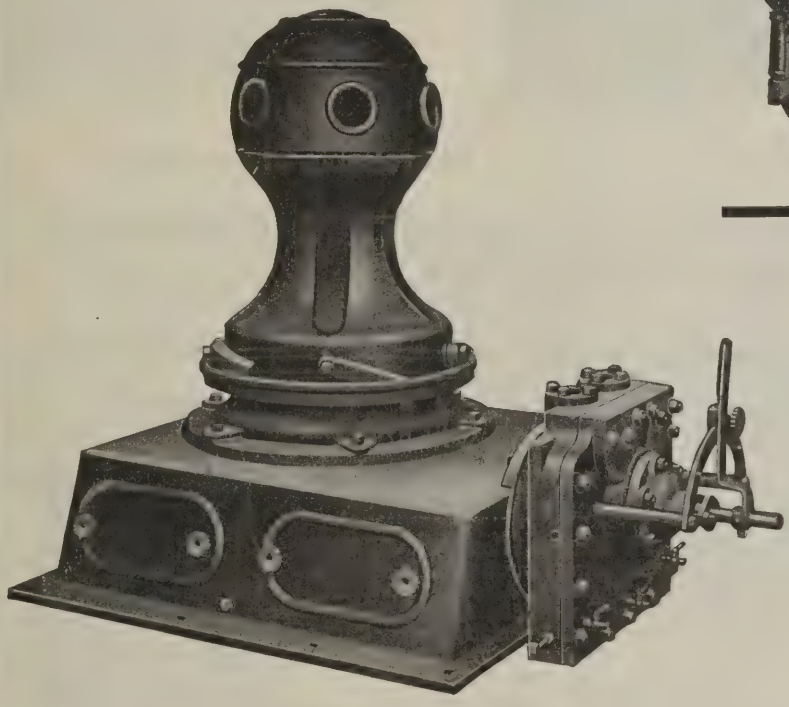

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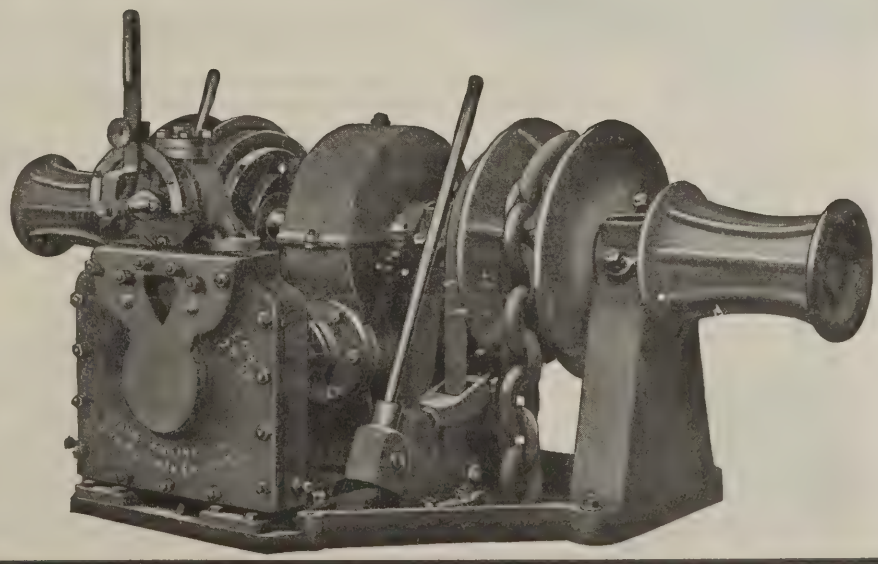

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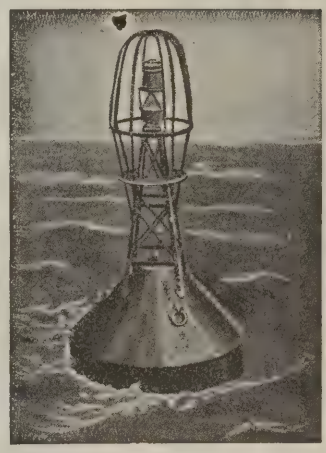

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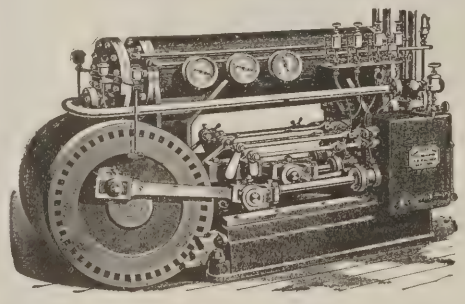
contains no chemicals. It is placed in the engine room, while the ice-making box and meat rooms are at distant places of the steamer.



STEAM YACHTS—Lorena, Constant, Riviera, Emeline, Apache, Electra, Nourmahal, Josephine, Virginia, Thespia, Dorothea, Alcedo, Enterprise, Felicia, Aloha, Attaquin, Nydia, Alvina, Margaret, Kanawha, Pantooset, Rheclair, Aztec, Rambler, Surf, Sultana, Emrose. Over two hundred in daily service in the tropics on men-of-war, steam yachts and mercantile steamers.

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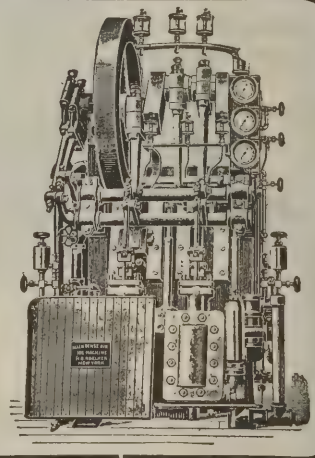

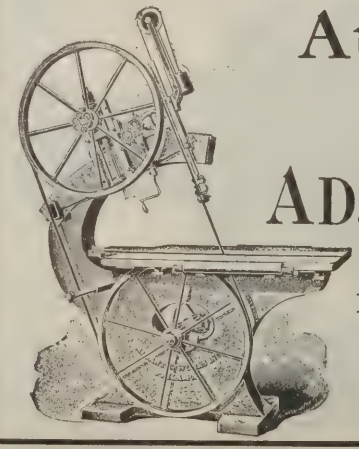

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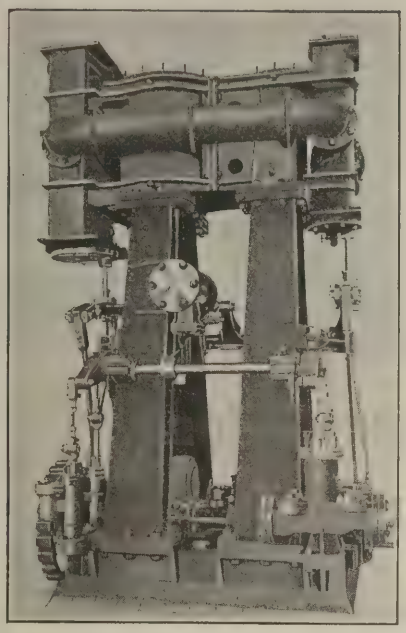

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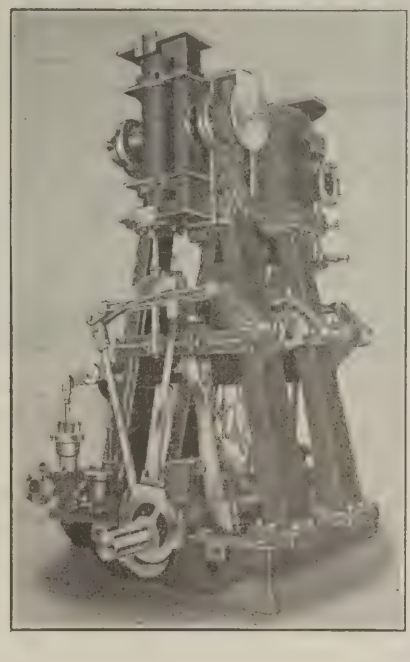

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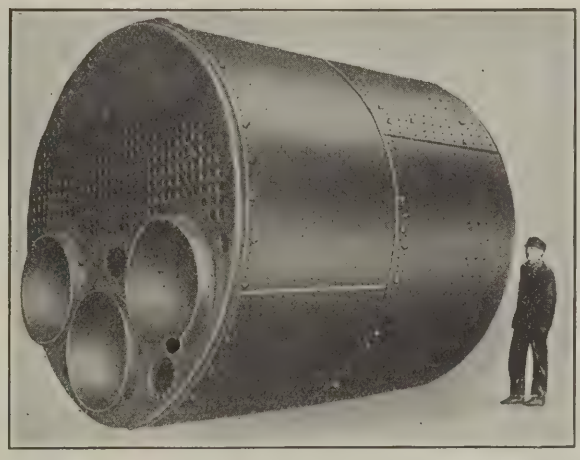

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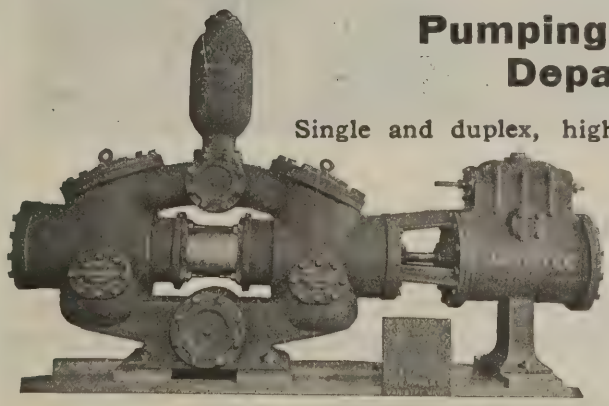

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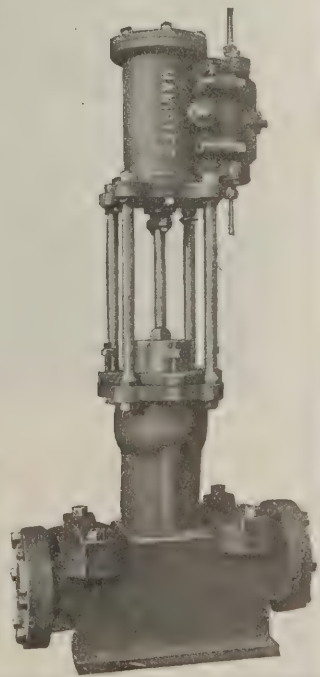

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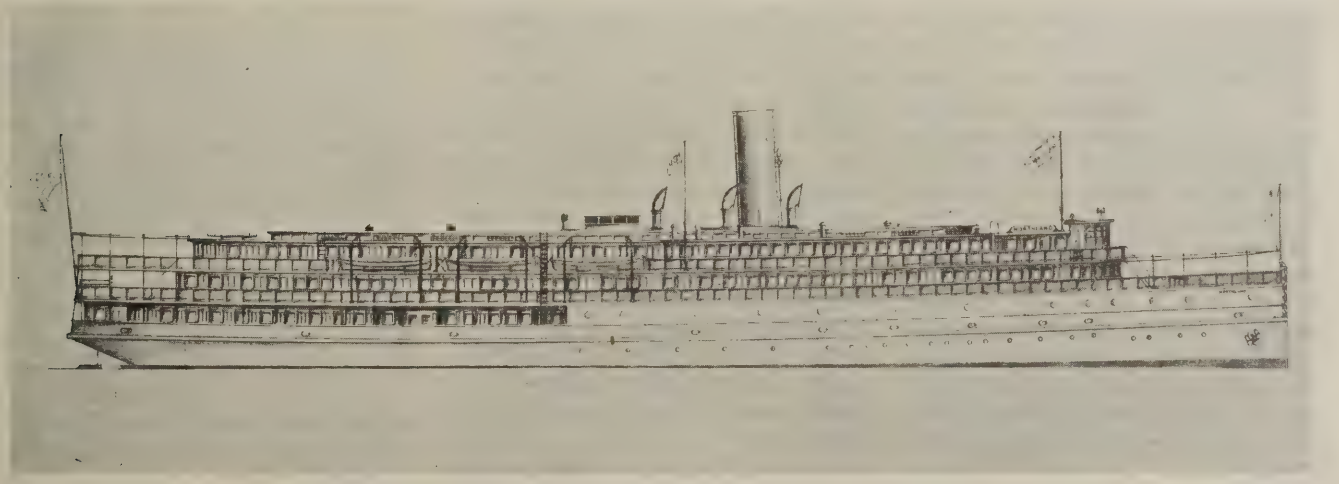
JAN 4 1927

THE MARINE REVIEW

VOL. 40. CLEVELAND DECEMBER, 1910. NEW YORK No. 12

NEW STEAMER NORTHLAND

THE steamer Northland, launched Nov. 19 from the yard of the Harlan & Hollingsworth Corporation, Wilmington, Del., will be a handsome addition to the fine vessels run by the Norfolk & Washington Steamboat Co., between Washington, D. C., and Norfolk, Va. This vessel has been designed and built by the Harlan & Hollingsworth Corporation, under the direct supervision of D. J. Callahan, vice president and general manager of the Norfolk & Washington Steamboat Co., and his superintending engineer. She is 305 ft. over all, 296 ft. perpendiculars, 52 ft. 6 in. beam extreme, 42 ft. beam molded, designed draught without freight or passengers about 12 ft.



STEAMER NORTHLAND, OF THE NORFOLK & WASHINGTON STEAMBOAT CO.'S FLEET.

The vessel will be propelled by a four-cylinder, triple-expansion engine, steam being supplied by four Scotch boilers, which machinery will propel her at a speed of about 19 miles per hour.

The vessel has exceptionally fine, clean lines, and the hull is flared out for whole length, which gives additional deck room without recourse to the usual guard braces, necessary with an overhanging guard.

The steel structure, like that of the Southland, is very heavy for a vessel engaged in bay service. The frames and beams are of 6-in. channel steel, spaced 24-in. centers. The shell plating is above rule requirements for a vessel of this size, and is fitted with heavy doublings in vicinity of waterline, and for a considerable length the strake below the sheer strake is doubled. The main and lower decks are plated entirely over with steel, and steel pillars and girders support all decks. Five watertight bulkheads subdivide the vessel transversely into compartments. Web or belt frames are fitted to every frame in machinery space, and on every tenth frame outside of same. Keelsons of channel section combined with the web frame construction and steel pillars and girders make a very stiff and rigid structure.

The enclosure around smoke stacks, engine opening and kitchen uptake are of steel insulated to insure safety from fire, and all upper wood works are supported by steel girders and stiffened by web frames. The principal stairways throughout the vessel are of steel, which with the steel girders and supports will insure same holding position and being accessible until a fire has gained considerable headway.

On the lower deck forward accommodation is provided for petty officers, crew and colored men and women. The partitions of all rooms here are of steel, the beds are of iron pipe with metal springs, metal lockers are provided for

clothing, and steel stairways are provided for access to main deck. This forward compartment is, as far as practicable, rendered fireproof, and no fire could spread if started in this space by carelessness of passengers or crew. The steel deck here is covered with linoleum cemented down.

On lower deck, immediately abaft the engine room, a large kitchen is located, completely fitted out by Duparquet, Huot & Moneuse, with a 16-ft. range, two broilers, dish washing machine, automatic egg boiler, vegetable steamer, steam tables, tea, coffee and hot water urns, etc. Large cold storage room, ice boxes for meat and fish, store rooms, scullery, etc., are provided and conveniently arranged for rapid service.

Description of Dining Room.

The dining saloon is located immediately abaft this kitchen and two large electric fans are provided to draw fresh air through dining room from skylight and stairways, discharging into kitchen uptake vent. The dining room is finished in mahogany, having built-in buffets with mirror backs, silver and china cabinets with moss glass doors. The ceiling is paneled with composite board, finished white with gold relief and mahogany-capped beams and girders supported by steel mahogany encased columns. The tables and chairs are of mahogany and are arranged cafe style. The floor is covered with interlocking rubber tile. The electric fixtures in ceiling and around buffets are designed in harmony with general style of finish.

The stairway from the dining saloon lands in ladies' saloon on main deck and immediately over this stair another lands on saloon deck. At after end of ladies' saloon a stairway leads down to a ladies' cabin, where free berths are provided for women and two staterooms are located here for stewardess. This ladies' saloon has staterooms around sides with a toilet at after end. The walls of saloon are paneled with composite board having pilasters, ornamented frieze, and cast iron grille vent between carlins. The walls are finished ivory white with a white ceiling. Panels, cornice, caps, etc., are relieved with gold, the hardware and electric light fixtures are finished to conform with surroundings.

The entrance hall is located immediately forward of ladies' saloon and is paneled in mahogany from floor to ceiling. The ceiling is finished with large panels of composite board relieved by mahogany encased girders and beams, and supported by columns of a similar character. The entrance doors from outside and to ladies' saloon and bar room, also bulkhead between entrance hall and bar, and ladies' room have large panels of moss glass fitted in small framed sections; the windows are treated in like manner, and all protected by heavy brass railing. The entrance hall is used as a smoking room, the floor is covered with rubber tile and ceiling has ventilating registers fitted. The purser's office and barber shop are each entered from this hall, the floors of each are covered with interlocking tile, and the rooms are fitted with every convenience necessary.

The bar is a large room, finished in fumed oak, old English style, with deep frieze and paneled ceiling; the bar counter and sideboard for glasses, etc., cigar stand, and ice box are all built-in and are of same character and design as panel work of room. The furniture is upholstered in leather and floor is covered with interlocking tile of suitable design.

Forward of bar room on main deck accommodation is provided for chief and assistant engineers, and all space intervening between this and mail, baggage, and toilet rooms forward is used as freight space. The deck here is covered with 1¼-in. oak sheathing on top of the pine deck.

Saloon and Galley Decks.

The saloon deck is given up entirely to passenger accommodation. The staterooms are arranged along each side of a center saloon. Ventilation has been amply provided for by passageways being left between each group of rooms, having at their ends a sliding window. This enables the inside saloon to be kept fresh when all stateroom doors are closed. The saloon walls are paneled with composite board finished Empire style. The ventilating grills to staterooms are of cast iron in keeping with design. The cornice is handsome and the whole is finished in white with gold relief. Two stairways lead from main deck to this deck for passengers' use. Ample saloon and observation room accommodation is provided, handsomely furnished and carpeted. The stateroom floors are of hardwood and rugs are fitted in each. There are eight bedrooms on this deck, fitted with full size brass beds.

The gallery deck has same headroom as saloon deck, and walls are treated in a similar manner. In addition to the usual staterooms, there are eight large bedrooms having four bathrooms, or one between each pair of bedrooms. These bedrooms are all handsomely furnished and finished, the walls and ceilings being paneled in composite board with suitable moldings. The floors are of hardwood with oriental rugs, windows are curtained, the beds are of heavy brass, and the furniture in keeping. The total number of passenger staterooms on the Northland is 157. The bathrooms have floors laid with ceramic tile, having a border and sanitary base with wall tiling to height of wainscot. Above wainscot the bathroom walls are paneled and all finished enamel white. The bath tubs are porcelain enameled and hot and cold fresh or salt water is supplied. Storm grab rods are fitted where required and all fittings in bathroom are nickel plated.

Officers' Quarters.

The pilot house and officers' quarters are located on gallery deck. The pilot house is finished in oak and has floor rubber tiled. The captain's and officers' quarters, located abaft pilot house, are finished in oak and well furnished. A bathroom is provided for the captain, finished similar to those for passengers.

The gallery and all stairways and walls have art metal balustrade surmounted by a mahogany rail subdivided by mahogany stanchions and terminating in mahogany newels or posts. The stairways are all of metal, treads being covered with rubber tile having usual brass trimmings. The dome skylight is carried full length of gallery deck with art glass transom, and has a paneled ceiling well lit by inverted dome fixtures. This vessel will be particularly well lit and ventilated. Drinking fountains or alcoves are located at convenient places for ice water. The furniture through the saloons is of mahogany, upholstered in Spanish leather. The open deck space provided for passengers on saloon and gallery decks is covered by an awning.

The electric generating plant consists of two 35-k. w. dynamos, suppling current for machines in kitchen, fans, and lights. The steering engine is the Williamson differential type, located in a house on main deck, operating a crosshead on rudder head directly by means of rocker arms. This engine is controlled from steering column in pilot house as well as from steering column on saloon deck aft. A hand-screw gear is also supplied and located aft on saloon deck. The windlass is of the Hyde type, fitted with wildcats, stoppers, etc., for cables. Stockless anchors are used and housed in large hawse pipes. Two warping capstans, dock type, made by the American Ship Windlass Co., are located on main deck aft.

Machinery and Auxiliaries.

The vessel will be propelled by a four-crank, triple-expansion engine, having four cylinders, high pressure 23½ in., intermediate 37 in., and two low pressure,

each 43 in. diameter, the stroke being 42 in. The cylinders are arranged with one low pressure forward, and the other aft, with high and intermediate between, each having one piston valve, which is worked by the Stephenson link motion, with the usual direct connected steam cylinder for reversing.

The crank shaft is 12½ in. diameter, built-up into two pieces and coupled together between the high and intermediate cylinders; the main bearings are of cast steel, five in number. The back columns are of cast iron inverted "Y" pattern, one under each cylinder; the front columns are polished steel, six in number. The turning gear consists of double-cylinder engine, connected by the usual worm and wheels to crank shaft coupling. The condenser is circular, of steel plates, containing about 3,450 sq. ft. surface, placed at back of engine and connected to low-pressure cylinders by copper exhaust pipes. The propeller is a solid four-bladed steel casting, 12 ft. 8 in. diameter.

All pumps are independent of the main engines, several of them being in duplicate, as follows: One vertical twin beam air pump, two vertical duplex feed pumps, one horizontal duplex donkey and fire pump, one horizontal duplex bilge pump, two horizontal duplex salt water pumps, two horizontal duplex fresh water pumps, one horizontal duplex pump for draining steam heating system, one centrifugal circulating pump direct connected to single-cylinder engine for condenser. A feed water heater of the multicoil type is fitted between the feed pumps and boilers.

The boilers are of the cylindrical return tube type, four in number, 12 ft. 6 in. diameter by 11 ft. 3 in. long, allowed a working pressure of 180 lbs. per square inch. Each boiler has three suspension type furnaces, 3 ft. 6 in. diameter, and 265 tubes, 3 in. diameter. The boilers are worked under natural draft, the uptakes being connected to one double stack.

The ashes are handled by means of a hydraulic ash ejector for use at sea, and hand winch in one ventilator for use in port. There are four large ventilators in the fire room and two in the engine room.

ANNUAL MEETING OF SOCIETY OF NAVAL ARCHITECTS AND MARINE ENGINEERS

THE eighteenth annual meeting of the Society of Naval Architects and Marine Engineers was held in the rooms of the society, Engineering Societies building, No. 29 West Thirty-ninth street, New York, on Nov. 17 and 18, and in point of interest and attendance has not been exceeded by any previous meeting. President Stevenson Taylor presided. The report of Secretary-Treasurer W. J. Baxter showed the society to be in good financial condition with total resources of $24,584.80, against which there is a liability of only $600. The membership, however, shows a reduction from 796 to 769, due to the fact that there were 47 suspensions for non-payment of dues, the sum of $2,247.28 being charged off the books thereby.

The members rose while the death roll was read, as follows:

W. T. Powell,
C. R. Roelker,
Horace See,
N. P. Towne,
F. M. Wheeler.

The council elected the following:

(For the term expiring Dec. 31, 1916.)

Vice-presidents:

George W. Quintard, Quintard Iron Works, foot of Twelfth street, New York.

Walter M. McFarland, Babcock & Wilcox Co., 85 Liberty street, New York.

The society by its ballots elected as members of council:

(For the term expiring Dec. 31, 1913.)

W. I. Babcock, naval architect, 17 State street, New York.

W. F. Durand, professor mechanical engineering, Stanford University, Cal.

Nathaniel G. Herreshoff, vice-president and general manager, Herreshoff Mfg. Co., Bristol, R. I.

H. I. Cone, engineer-in-chief, United States navy, Washington, D. C.

J. H. Linnard, naval constructor, United States navy, retired, University club, Philadelphia.

W. A. Post, general manager Newport News S. B. & D. D. Co., Newport News, Va.

Associate Members of Council:

W. H. Brownson, rear admiral, United States navy, retired, 1751 N street, N. W., Washington, D. C.

J. R. Andrews, president, Hyde Windlass Co., Bath, Me.

The council elected as member of council, vice Horace See, deceased:

F. L. DuBosque, assistant engineer floating equipment, Penn. R. R. Co., Jersey City, N. J.

Transfer From Member to Life Member.

Stevenson Taylor, president of society.

Mason S. Chace, naval architect, 31 Wales street, Dorchester, Boston, Mass.

Members:

Joseph S. Blackett, surveyor Lloyd's Register, 17 Battery place, 247 Seventy-ninth street, Brooklyn, N. Y.

Clarence A. Carr, captain, United States navy, inspector of machinery United States navy, Babcock & Wilcox Co., Bayonne, N. J.

Harry C. Crosby, chief hull draftsman, The Moran Bros. Co., Seattle, Wash.

A. M. Dollar, superintendent engineer, Dollar Steamship Co., 160 California street, San Francisco, Cal.

William J. DuBois, general manager, American Mail Steamship Co., 100 Broadway, New York.

Charles B. Calder, general manager Toledo Ship Building Co., Toledo, O.

Howard C. Davis, marine department, Griscom-Spencer Co., 90 West street, N. Y.

John F. McIntosh, chief engineer, Union Oil Co., Mills building, San Francisco, Cal.

Daniel G. McAlpine, marine superintendent, Old Dominion Coal Co., Sydney, N. S.

Dr. Ing. Frederick Gebers, chairman, Imperial Experimental Station, Berlin N. W. 25, Schlenseninsal, Germany.

Arthur W. Berresford, general manager, Cutler Hammer Mfg. Co., Milwaukee, Wis.

Hermann Hullmann, chief constructor, German navy, Berlin W., Reichs-Marine-Stat.

Francis J. S. Nolan, 453 Winslow street, Camden, N. J.

Albert Norris, lieutenant, United States naval academy, Annapolis, Md.

Bernard A. Sinn, 74 Broadway, New York.

Gustav Schmitt, ship and engine surveyor, 25 Whitehall street, New York.

Dr. Rudolph Veith, engineer-in-chief, German navy, Berlin W.50, Spichernstrabe 23.

Harry W. Warley, superintending engineer, foreign shipping, Standard Oil Co., 26 Broadway, New York.

George J. Robinson, superintendent, J. N. Robins Co., Erie Basin Dry Docks, Brooklyn, N. Y.

Anthony J. McGarvey, superintendent, J. N. Robins Co., Erie Basin Dry Docks, Brooklyn, N. Y.

Albert W. Murray, surveyor, Lloyd's Register of Shipping, 17 Battery place, New York.

Edmund Mills, Marine department, Babcock & Wilcox Co., 85 Liberty street, New York.

William G. Lumsden, mechanical engineer, Electric Boat Co., Quincy, Mass.

Charles H. Bartlett, chief engine draftsman, Electric Boat Co., Quincy, Mass.

Gregory C. Davison, vice-president, Electric Boat Co., 11 Pine street, New York.

Charles H. Bedell, electrical engineer, Electric Boat Co., Quincy, Mass.

Frank T. Cable, superintendent, Electric Boat Co., Quincy, Mass.

Harry C. Farrar, surveyor, Lloyd's Register, 173 Eightieth street, Brooklyn, N. Y.

Henderson B. Gregory, inspecting draftsman, bureau of steam engineering, navy department, Washington, D. C.

Thomas H. White, ship and engine surveyor, 77 Broad street, New York.

George Kotter, superintending engineer, Hamburg-American line, 639 Garden street, Hoboken, N. J.

Frank H. Evers, surveyor, American bureau of shipping, 725 Castro street, San Francisco, Cal.

Henry Black, consulting engineer and ship surveyor, 15 Whitehall street, New York.

William S. Rogers, chief draftsman, The New England Navigation Co., Newport, R. I.

Frank S. Martin, engineer and naval architect, 52 Beaver street, New York.

Associate.

Charles E. Montgomery, assistant to superintending engineer, Panama R. R. S. S. line, 24 State street, New York.

Benjamin B. Pender, general foreman, Balboa Shops and Shipways, Balboa, Panama.

William E. Williams, The Williams & Wells Co., 250 Fulton street, New York.

Benoist d'Azy, lieutenant commander, French navy, naval attache, French embassy, Washington, D. C.

A. Edward Bowers, chief draughtsman, hull department, Staten Island Ship Building Co., Port Richmond, S. I.

Carl A. Carlson, civil engineer, U. S. N., bureau of yards and docks, navy department, Washington, D. C.

A. Clifton Leaveston, chief draughtsman, engineering department, Staten Island Ship Building Co., Port Richmond, S. I.

Joseph S. Shultz, civil engineer, U. S. N., bureau of yards and docks, navy department, Washington, D. C.

Naoji Tomikawa, chief draughtsman, Mitsu Bishi Dockyard & Engine Works, Kobe, Japan.

Associate to Members.

Lew Morton Atkins, assistant naval constructor, United States navy, navy yard, Boston, Mass.

Donald Raymond Battles, assistant naval constructor, United States navy, Fore River Ship Building Co., Quincy, Mass.

Lee Scott Border, assistant naval constructor, United States navy, navy yard, Mare Island, Cal.

Frederic Gallup Coburn, assistant naval constructor, navy yard, Mare Island, Cal.

Waldo Putnam Druley, assistant naval constructor, navy yard, New York, N. Y.

Edwin O. Fitch, Jr., assistant naval constructor, navy department, Washington, D. C.

Paul Henry Fretz, assistant naval constructor, navy yard, Boston, Mass.

Julius A. Furer, assistant naval constructor, navy yard, Charleston, S. C.

Charles Anthony Harrington, assistant naval constructor, navy yard, Portsmouth, N. H.

Sidney Morgan Henry, assistant naval constructor, navy yard, New York.

Herbert Seymour Howard, assistant naval constructor, navy yard, New York.

Parker Henry Kemble, district manager, Edison Electric Illum. Co., 360 Pearl street, Brooklyn, N. Y.

Edwin Graham Kintner, assistant naval constructor, navy yard, Norfolk, Va.

Harry G. Knox, assistant naval constructor, navy yard, Boston, Mass.

Emory Scott Land, assistant naval constructor, navy yard, New York.

Roy Warren Ryden, assistant naval constructor, navy yard, Portsmouth, N. H.

Ross Pelton Schlabach, assistant naval constructor, navy yard, Charleston, S. C.

Clayton Miller Simmers, assistant naval constructor, navy yard, Puget Sound, Wash.

Townsend Johnson Smith, T. S. Marvel Ship Building Co., Newburgh, N. Y.

George C. Westervelt, assistant naval constructor, navy yard, New York.

John Williams Woodruff, assistant naval constructor, United States naval station, New Orleans, La.

W. P. Stephens, yacht designer, Avenue A and Thirty-second street, Bayonne, N. J.

Juniors.

Lawrence E. Chapman, Massachusetts Institute of Technology, Boston, Mass.

Torjorn Hermanrud, draftsman, Fore River Ship Building Co., Quincy, Mass.

John D. Schmidt, student, Webb's academy, New York City.

A. Harold Jansson, draftsman, experimental model basin, navy yard, Washington, D. C.

Roy P. Mills, draughtsman, hull division, navy yard, New York.

Amendment to By-Laws.

An amendment of the by-laws, adding the following words to paragraph 5, section 3, article 2, referring to Junior members, was adopted:

"When they are twenty-six years of age, they shall be offered the option of being transferred to active or associate membership, if they duly qualify; but if they do not accept such offer or do not qualify, they shall be dropped from the rolls of the society."

President Taylor's Address.

President Stevenson Taylor, in his presidential address, said:

"I thank you again for the great honor you have conferred upon me. You have placed me in the position heretofore occupied during the existence of this society, by two men most distinguished in their careers—Clement A. Griscom, who stands foremost among those interested in American shipping, and Francis T. Bowles, former constructor-in-chief with rank of rear admiral, and now the head of one of the large ship building plants of the United States.

"These gentlemen gave a great deal of thought and time in their endeavors to organize and carry on this society, and to their endeavors the success of the society has been very largely due.

"We endeavored to have these distinguished past presidents at this meeting. but Mr. Griscom had made previously important engagements which prevent his presence, and, as you are all aware, Admiral Bowles has met, in the recent loss of his son, a great bereavement, in which he and his family have, I know, your heartfelt sympathy.

"The past presidents have a reputation which seems to me difficult to live up to, and I can only assure you of my intended conscientious attention to your interests with the hope that they may not be entirely in vain and I trust that at the completion of my term of office I may at least deserve the centuries-old commendation, 'Well done, good and faithful servant!'

"I congratulate the society on its mem-

bership, which will at this meeting be increased by at least forty members. This more than offsets the losses due to deaths and resignations, which amounted to twenty-six during the past year.

"There are yet a number of young men in our shipyards and engine building establishments to whom our proceedings would be of great advantage, and I desire that you shall bring them into our fold for their benefit as well as ours.

"The moderate dues hardly pay for the publishing of the proceedings and the better and more numerous the proceedings the greater the cost. I suggest that for the future benefit of the society such of you as may deem it feasible and wise shall become life members, thus creating a fund, which, as the years go by, will add to your regular income.

"The treasurer's report, as printed, shows clearly our financial condition, and at its meeting yesterday, the council wisely reduced some of the nominal assets, as will be duly reported to you.

Progress in Marine Engineering.

"There have been no special advances in the art and science of ship and engine building, for at the present time we seem to be in a period of development. Progress is being made in the application of a combination of reciprocating and turbine engines for marine use, and of a combination of fast running turbines with gearing for slow going vessels. Further developments in these directions are awaited with great interest, as will be also the use of producer gas and gasoline engines of larger units than have heretofore been tried.

"Our navy, in importance, quality and size of ships, if not in number, compares favorably with the navies of the world.

"Following in some respects the example of the later great merchant ships built abroad, battleships have increased in dimensions, displacement, speed and ordnance to a remarkable degree. In this connection, the first paper of today's meeting, written by our distinguished honorary member, Sir William White, whose career as naval constructor in England is so well known, presents views on the growth of war vessels and on the eternal question, guns versus armor, armor versus guns. This paper will particularly interest not only those of you who are responsible for our navy, but those who are directly responsible for the vessels of all other navies. I commend it to your careful consideration.

"There has been a great development in the past few years in that branch of mechanics which may be termed aeronautics. The improvements in both dirigibles and aeroplanes, particularly in the latter, have been marvelous. It is but five or six years since man made a flight of a few feet with a heavier than air machine. During the past year, flights of distance and altitude have been made that were hardly dreamed possible, but a short time ago. To what uses these wonders of the air may come, it is dangerous to predict more particularly as to their limitations, for in the light of the achievements of the past quarter of a century it is a bold man or foolish one, as you may look at it, who says that any particular accomplishment is impossible.

"Unfortunately for true scientific progress, the recent aeronautic exhibitions have been of the hippodrome order, not commanding our highest respect.

"Though submarines have accomplished great feats, experiments are still being made to add to their efficiency.

Oil Fuel for Steamers.

"Oil fuel, applied for marine use, has passed the experimental stage. Excellent results have been accomplished and many advantages proven. Where coal is scarce and oil is plenty, oil fuel is naturally used to great advantage, but the storage, the safety in use, and the procuring of oil of the same quality at all times are yet sufficiently experimental to warrant the study still given to this subject where coal is cheaper than oil.

"So in all the varied branches of our professions we are still achieving, still pursuing.

"In the beginning of this year, this society was honored by the Institution of Naval Architects of England by its invitation to join in a Jubilee Meeting in London, celebrating the fiftieth anniversary of the founding of that most distinguished society. As you know too well, the death of their beloved King Edward VII compelled a postponement of their celebration, and with that great people, in common with the rest of the world, this nation mourned.

"We are now advised that the Jubilee Meeting will be held in London, commencing July 4 next, and I can assure you that those who may be so fortunate as to be able to accept their cordial invitation, will receive a warm welcome. May many of you go.

Aiding Our Merchant Marine.

"One subject near to our hearts is that of the American Merchant Marine. 'Hope deferred maketh the heart sick,' and the hopes deferred in this matter have almost caused heart failure.

"Protection has been the leading theory and practice of great political parties and has led the country at large into great prosperity. Everything going into a ship has been amply protected, excepting the building thereof. The very protection given various materials and labor in the manufacturing of them has so added to the cost of building ships that it is impossible to compete with the cheaper labor and materials of foreign countries, and yet the word 'subsidy' substituted for the word 'protection' has, for some curious reasons, become almost disreputable and the cry is raised—shall we spend public money for the benefit of a few shipbuilders? Had this thought obtained to any degree in relation to the many large industries of the country so well fostered by the tariff, there today would have been a dependence on foreign manufacturers truly deplorable, and a billion dollar congress impossible.

"One great difficulty with the subject of legislation tending to increase the merchant marine is that the advocates, though they see clearly the great need and the public advantage of an adequate merchant marine, have such varied methods of accomplishing the desired result.

We Must Have Ships and Yards.

"For my own part, I have come to the conclusion that a subsidy for establishing lines to South America, or other specific countries, that extra payments for carrying mails and for tonnage and speed, in short that the various methods of special rewards are entirely futile; and that there only remains for us to go back to the practice of our forefathers and establish discriminating duties. This is not the time for arguments on this question, and opinions may change. I know that strong men differ, but we are like the children in Maeterlinck's fairy play, looking in various directions for our particular 'Blue Bird;' and finding it not; and some day, not too far off, I trust, the people of this great nation with its thousands of miles of seaboard, with its great protective navy, which in the final analysis must depend upon a merchant marine, with its many and large productions from the soil, and from its varied manufactures, will realize the supreme importance of having ships and yards in which to build them, will realize that we are today deliberately passing to foreigners annually enormous sums which should be earned by our own citizens; and they will come to themselves, will unite on the right course, will demand from their representatives a change in the present condition, and they will get it. So be of good cheer. Let your hearts faint not.

"One of the best features of these society meetings is the social side of them. Here we gather annually, many of you rivals in intense competition

during the remainder of the year, but here friends, renewing acquaintance and reviewing accomplishments. I know of no better way of avoiding misunderstandings, heartburns and ill-feelings, than getting together in these meetings, and I am proud to say that in this particular this society has been exceedingly fortunate.

Social Side of the Meetings.

"Let me urge you to continue this good course. Let the younger members not hesitate to make themselves known to the elders and the elders not forget their own struggles in youth. Be ready to extend helpful thoughts to each other, and remember, though you cannot see the growth of shipbuilding as you desire, you are members of a profession second to none in building material things. Your members may be comparatively small, but you combine in yourselves the knowledge and the skill of all of the other special mechanical and engineering societies, and your problems are more difficult to solve." (Applause.)

Loving Cup for Admiral Bowles.

The special committee, appointed at the 1909 meeting, to prepare some suitable recognition of the services of Admiral Bowles to the society, recommended to the council that a loving cup be presented to the admiral and submitted the following appreciation:

"The services of Admiral Bowles to the Society of Naval Architects and Marine Engineers in connection with its formation and development, are too definitely indicated in the proceedings of the society and are also too well known to its individual membership to require any extensive enumeration, even for purposes of historial record. It seems most fitting, however, that formal mention be made of the facts that he was one of the principal organizers and incorporators of the society, was the first chairman of its executive committee, and served for a period of five years as its secretary, and more than five years as its president. Such a record of accomplishment speaks for itself, and any added force, which might be given through formal expression by this committee, is believed to be best conveyed by quoting some remarks made by the late lamented Commodore Loring, one of the founders and original vice presidents of this society. These remarks were made by Commodore Loring on the closing day of the first annual meeting of the society, in proposing a vote of thanks to Admiral Bowles, and were as follows:

"'Mr. President and Gentlemen:—There has devolved upon me the very agreeable task of proposing a vote of thanks to one whose happy idea is responsible for the pleasure and profit we have derived from the inaugural meeting of this society.

Recalling Commodore Loring's Remarks.

"'While individual commendation is, in general, to be deprecated, historical accuracy is never amiss, and the first volume of the published transactions of this society would not be complete did it not contain a formal recognition of the services of one whose felicitous conception, aided by your generous and united efforts has culminated in such gratifying results.

"'As Col. Stevens so aptly pointed out at the banquet last evening, our society now needs no sponsor, but we must not forget that this success, thorough and incontrovertible though it be, has been the result of studious thought and painstaking care.

"'In all the work of inception and execution, the master mind and guiding hand have been those of Naval Constructor Francis T. Bowles, and it is to his unerring skill and tact, and untiring devotion that we are indebted for the formation of a society which will always be a means of professional advancement, and which cannot but prove a potent factor in the reawakening of general interest in our shipbuilding development, and in the ultimate attainment of that maritime supremacy which once was ours, and must in the future inevitably return.'

Resolution of Appreciation.

"The unusual tribute to Admiral Bowles, made by Commodore Loring in 1893, in proposing the society's vote of thanks to that gentleman, was seconded by Col. Stevens and unanimously endorsed by the society. In the years of development of the society, which followed, the subject of this tribute, through his earnest, loyal and devoted service to its best interests, has not only justified the original tribute, but placed the society under renewed obligations which have found appreciation in his election to the highest office in the gift of his colleagues. As a further mark of appreciation of the services of its late president, the committee recommends to the society for its approval, the following resolution:

"'*Resolved*—That the Society of Naval Architects and Marine Engineers desires to avail itself of this first opportunity since the completion of his term of office as president, to give formal expression of its appreciation of the services of Rear-Admiral Francis Tiffany Bowles, whose skill, tact and untiring devotion—first, as organizer, and later, as secretary and president, contributed in so conspicuous a degree to the development of the society and its present assured position among scientific institutions; and that in furtherance of the foregoing expression of appreciation, the president is directed to have this resolution and the accompanying report of the committee recorded in the minutes of the society, and a copy thereof suitably engrossed and forwarded to Admiral Bowles.'

"Very respectfully—W. L. Capps, chairman; Stevenson Taylor, ex-officio; E. A. Stevens, Geo. E. Weed, Andrew Fletcher and W. J. Baxter."

The report was adopted. The loving cup was presented to the admiral at the banquet on Friday evening.

Notes on the Armaments of Battleships

THE society then proceeded to the reading of the papers. The first paper presented was "Notes on the Armaments of Battleships," by Sir William H. White, which was read by D. H. Cox. Following is an abstract of its principal features:

Wide and deep differences of opinion prevail in regard to this subject; as a consequence, it may be anticipated that conclusions which the writer has reached will be challenged and declared to be unsound. Nothing but good can result from discussion and criticism when they are conducted on proper and temperate lines as they will be in this society; and consequently the writer has not hesitated to express freely his dissent from doctrines which other persons have set forth in dealing with the subject, and will not object to equally free criticism being made of the following statement of principles to which he has been led by study and experience during the 43 years that have elapsed since he first joined the constructive department of the British Admiralty.

One fundamental idea has governed the armaments of warships in all ages: viz., the desire to provide means of offense which will enable a ship making an attack to put her enemy "out of action" in the shortest possible time and insure the least possible damage to the attacking ship during the conflict. It may be admitted also that, under modern

conditions, an active offense is no longer the only means of defense; but, on the other side, it cannot be denied that an active offense is still and always must continue to be the best means of defense. It gives the greatest assurance of victory—in other words, the greatest probability of putting an enemy "out of action."

Victory never has depended and never will depend entirely upon the destruction or capture of an enemy's ships, but upon their being brought into a condition of incapacity to continue the struggle—that is to say, being put out of action. That result may be attained in many ways, but it must be reached in some way before victory is secured. Looking back upon the great wars of the eighteenth and beginning of the nineteenth century, it is seen that ships were put out of action by the destruction of or serious damage to their means of propulsion, to their mobility and maneuvering power; by being set on fire; by slaughter of their crews; by loss of morale; by panic arising from accident or damage which prevented continued utilization of existing means of offense; by overpowering or seriously injuring the armaments, and in other ways that need not be particularized.

From the point of view of this paper, the question to be considered may be stated, therefore, as follows:—What description of armament is likely to prove most effective for speedily putting out of action modern battleships, having regard to existing materials of construction, structural arrangement, armor defense, means of propulsion and maneuvering; as well as to the characteristic qualities of guns, projectiles, explosives, torpedoes and mines now available for use? It will be assumed that there is no need to recapitulate the remarkable advances which have been made during the last half century.

Certain features may be assumed to lie outside the field of discussion. It is agreed that naval actions will be fought at longer ranges than in the past. The reasons for this are to be found, on one side, in the development of locomotive torpedoes, while on the other side stand improvements in naval gunnery.

Long Fighting Range and Secondary Armaments.

In regard to the probable fighting range for future naval actions there are marked differences of opinion. Two distinct schools of thought exist as to the minimum range likely to occur in practice. One asserts that an extremely long range will be chosen and maintained by commanders whose fleets possess greater speed and whose ships are armed on the "single-caliber, big-gun" principle; and it is argued that at this great range vessels so armed will be able speedily to put out of action an enemy's ships which individually carry fewer big guns, although these may also possess powerful and well-protected secondary armaments.

The other school maintains that, although actions may be begun at very long ranges on occasions when atmospheric conditions are favorable, average conditions of weather at sea will not favor that kind of attack nor make its results decisive.

In their judgment, it is desirable to associate with big guns a powerful secondary armament of quick-firing guns, adequately protected and so placed as to be efficient both in horizontal command and in height above water, while free from interference arising from independent firing of heavy guns.

The Number of Heavy Guns to be Mounted.

As to the most suitable numbers and calibers of guns, making up the secondary armaments of modern battleships, little need be added. There are obvious objections to the employment of many calibers, each requiring special ammunition and making separate control desirable. In some ships, guns of 6-in., 4.7-in., 3-in. and smaller calibers have been mounted. The writer has long advocated a simpler arrangement which, in his judgment, would fulfill all requirements, and ventures to quote remarks on this head, made at the Institution of Naval Architects, a few months ago:

> The ideal armament, to my mind, is that which embodies a certain and not an extravagant number of heavy guns, associated with a considerable battery of 6-in. guns. It does not seem to me a difficult matter to supply these 6-in. guns with ammunition which shall be efficient when used against attacking torpedo vessels. If anything, in addition to such a secondary armament of 6-in. guns is wanted I should say "man killing" guns capable of very rapid fire might be used for sweeping the decks of torpedo vessels; they could be placed and fought in almost any position and would require only shield protection.

The main reason for preferring a caliber of about 6 in. is that experience proves projectiles of about 100 pounds weight to be the maximum which can be "man-handled" continuously and rapidly; while accuracy of fire even at long range can be combined with rapidity of discharge and remarkable effectiveness against the lightly armored, unarmored and vulnerable points of warships.

Turning to the consideration of what constitutes a reasonable number of heavy guns for the principal armament of a modern battleship, it will suffice to restate the writer's conclusions and to briefly summarize the reasons therefor. These conclusions are admittedly open to debate and other views may be maintained on the basis of solid argument.

There are two positions for heavy guns which confer supreme advantages, and are always utilized. These are at the center line; one commanding right-ahead, with large arcs of training reaching well abaft the beam; the other commanding right astern and over large areas, reaching well before the beam. Until the Michigan and South Carolina were designed, it was the general practice to mount one or two heavy guns—two in nearly all cases—in each of these positions. Superposed turrets were tried in some cases, and 8-in. guns were mounted in the upper emplacement; but this practice did not find much favor and may be considered to have dropped out of use. It was a new and bold departure in the Michigan and South Carolina to place two turrets in each of the supreme positions, and to arrange for firing the guns in one turret over the top of the other turret. That arrangement proved successful, however, and has been largely adopted in recent ships of all navies.

The writer has always favored and still favors the system of mounting heavy guns in pairs. French designers long preferred separate mountings for single heavy guns, but subsequently abandoned the arrangement. Considerable economy is thus effected in the weight of the mountings and armor protection for a pair of heavy guns as compared with what is needed with separate mountings for each gun; and although the risk of simultaneous disablement of two guns is necessarily incurred when they are carried on a single turntable and within the same armored station, that does not seem to be an undue risk.

For more than 20 years, the heavy guns of most battleships continued to be four in number, and in nearly all cases they were mounted in pairs on the center line of the deck at the two important positions above described. In connection with the introduction of the latest types of battleships—usually described as "Dreadnoughts"—a necessity arose for finding other positions for heavy guns. Ten or twelve such guns have been usually thought desirable; thirteen guns are to be carried in ships now building.

During the last five years we have seen both the old French disposition and the echelon arrangement reproduced (in principle) in new designs, only to be abandoned in later designs, in some cases before practical experience had been gained with the arrangement which was abandoned. Now there is a marked disposition to place all the heavy-gun stations at the center line of the deck, so that all the guns may be available on both broadsides. It may be noted

that the United States navy took the lead in this last movement, and further has the credit of demonstrating the possibility of associating powerful bow and stern fire with the maximum of broadside fire over large arcs of training, by placing some turrets higher than others and firing over the lower turrets on certain bearings.

Objections to Large Numbers of Heavy Guns.

Multiplication of gun positions has been necessarily accompanied by considerable increase in the length of battleships even when the protection and speeds have remained practically unchanged. As a contrast we may take the Arkansas with a length of 545 ft. and twelve 12-in. guns as compared with the Florida of 510 ft. in length with ten 12-in. guns. It is true, of course, that increase of speed has even greater influence on dimensions and especially on length; but it is certainly remarkable to note the construction of armored ships which are about 700 ft. in length and yet carry only eight heavy guns in four positions (13.5-in. caliber) whereas only five years ago ships about 200 ft. shorter carried ten heavy guns (12-in.) in five positions, and others about 250 ft. shorter carried twelve heavy guns (11-in.) in six positions. Such additions to length may not be considered objectionable on the ground of diminished maneuvering power, in view of the facts that in future long-range fighting will be the fashion, that by various devices their handiness has been increased in proportion to their dimensions.

Under-water attacks by torpedoes, by submarines and by mines are undoubtedly among the greatest dangers to which modern warships are exposed, although the gun still remains the supreme weapon of offense. It is agreed that a single successful blow struck by a modern torpedo will probably produce damage which will put even the largest ship "out of action," although she may not be sunk. On this ground, therefore, it may be maintained that a limit ought to be put upon the concentration of gun armaments upon single ships, and upon the increase in dimensions and costs of individual ships; because a single successful blow may, by general consent, bring about such a serious proportionate loss to a fleet by injury to one vessel and her compulsory withdrawal from action. Moreover, many services are required from a fleet in the performance of which capacity for distributing the force is no less important than the power of concentrating it for an attack. From this point of view unlimited increase in dimensions, cost and individual power of battleships is not desirable. As to the assertion that increased steadiness of ships, considered as gun platforms, necessarily proceeds *pari passu* with increased dimensions, it need only be said that experience has proved the doctrine to be fallacious. It is a matter of common knowledge that some of the steadiest warships ever built have been vessels which were of small dimensions when judged by present standards. This feature in behavior, of course, is distinct from the power of maintaining speed in a sea-way; that quality is undoubtedly favored by increase in length and weight.

No claim is made that new statements of the case have been embodied in the foregoing summary of points in favor of or adverse to the adoption of battleship armaments comprising a large number of heavy guns in each vessel. All that has been attempted is to bring such points into view, fairly and briefly. Having done so, the writer desires to place on record his personal opinion that in no case is it desirable to carry more than eight heavy guns in a single ship, that these guns are best arranged in four positions as in the Michigan class, and that they should be supplemented by a powerful and well protected secondary armament.

Discussion on Sir William White's Paper.

THE CHAIRMAN:—You must have noted with pleasure the inferential compliment paid to our own naval constructors by Sir William, that it was a new and bold departure in the Michigan and South Carolina to place two turrets in each of the supreme positions, and to arrange for firing the guns in one turret over the top of the other turret. This paper is now before you for discussion, and I wish to say that the discussion is not to be limited to the actual membership. Any gentleman on the floor will be very gladly heard in these discussions. Perhaps it would be well for the secretary to read the written discussion first.

SECRETARY BAXTER: — The secretary would like to state that owing to certain unfortunate circumstances existing in New York recently, the papers have had to be handled by mail, and he has been unable to distribute to numerous people who will discuss this question with pleasure, and further written discussions are expected from our own people, or naval officers, even though they do not belong to the society, and also from various people abroad, which will all be printed in due time. I will now read a memorandum I have from Admiral Mahan on this paper.

Admiral Mahan's Discussion.

ADMIRAL A. T. MAHAN (communicated):—Your letter of Nov. 11 has reached me rather late for discussion of Sir William White's paper, which it encloses. My comment upon the paper, which I have read carefully, must therefore be confined to a brief expression of my general agreement with the conclusions of Sir William White and the following summary of the leading principles I conceive to be involved in the controversy between the all-big-gun ship, which, barring torpedo defense, is to carry no armament except a few of the very heaviest caliber used by its nation, and the mixed battery vessel, which, to fewer of the heaviest guns, adds a proportioned number of comparatively light pieces, variously called secondary, or intermediate. This is the type which commands the adhesion of Sir William White.

The argument for the all-big-gun ship, briefly, is that it, and the squadron to which it belongs, will always be able to keep at its own desired range; and that, being so able, it can and will always choose such a distance that the smaller guns of its opponents will be practically "out of action;" an aim which Sir William White accurately quotes as that of all ship fighting. Under this condition, the circumstances of the two fleets are reduced to the most heavy guns of the all-big-gun fleet opposed to the fewer of the mixed-battery fleet.

The reply to this is, that the fleet speed of any body of vessels is the speed of the slowest among them; and the maintenance of the all-big-gun distance pre-supposes a perpetual avoidance of close action by the fleet depending upon it—that is, constant withdrawal; that any mishap lessening the speed of a single member of the fleet entails the abandonment of that member, or the acceptance of close action, within the range of the mixed battery. The pursuing fleet follows with its best speed, because its slower members are in no danger, and will come up as a reserve.

Accuracy of Guns.

Much stronger assertion is made as to the inferior accuracy of the smaller caliber, under conditions of modern action. Sir William White tells us that naval officers having full and accurate information on this subject have assured him that the percentage of hits obtained with 6-in. guns under service conditions is not inferior to percentages obtained with guns of larger caliber. Accepting this, and also that, as was the case with battleships but a few years ago, three 6-in. are carried for one 12-in. gun, the number of 6-in. hits "under service con-

ditions" would be to 12-in. as three to one. This is "volume of fire." Considering the large amount of surface penetrable, and of crew accessible, to 6-in. projectiles, it is a very material consideration. It is to be remembered that the 6-in. projectile weighs 100 lbs., and that the repeated near burstings of such in rapid succession, even where they do not penetrate, is a tremendous nervous strain upon men subjected to them. This the Russians experienced at Taushima.

The very striking success of the system of fire control, developed within the past few years, has led those to whom the credit of this belongs, to insist much upon the difficulty of observation of the fall of projectiles, where two calibers are used. The splash of the 12-in. and of the 6-in. are often indistinguishable. I think this argument presupposes a deliberateness of fire control which will not obtain after the action becomes "hot." Till then, like two fencers, measuring each other's strength, there may be "passes" with the 12-in. on each side, to ascertain distance, and this will—and should—continue as long as possible. How long, is the question.

Increase in Caliber.

The all-big-gun conception leads necessarily to the wish for as many such guns as possible; or, what in aggregate impact is much the same, to each gun being made of as large caliber as possible. We have now risen from four big guns to twelve or thirteen; and from 12-in. to 14-in. The notorious difficulty of placing several pairs, shown by Sir William White, necessarily of itself impels to fewer pairs of heavier guns. This means, of course, proportionately fewer discharges and fewer hits. All is staked on the disastrous effect of the large projectile, hitting less often; just as, against a mixed battery, all is staked on the secondary (or intermediate) battery—the 6-in. guns—being kept out of action by superior speed.

The assumption of the advocates of all-big-gun ships are precarious, though plausible. Chief among them is the assured ability to choose distance, at least for a time, long enough to cripple the assailant decisively. This is the corner-stone of the whole edifice. Upon this is built up the entire program; more and more big-gun fire, therefore, bigger guns with fewer emplacements; bigger and bigger ships and fewer of them. Sight is lost of the fact, which Sir William brings forward, that the guns in three ships can be brought to bear effectively on the same number in two ships. This is concentration of fire; while the three ships, as compared with the two, give dispersion of target, a defensive provision entailing little offensive loss. This is exactly as in harbor defense; guns bearing from numerous positions on a critical point, concentrate fire, yet gain comparative immunity through their separateness—dispersion of target.

Concentration of Fire.

The efficacy of bigger ships and fewer of them depends in part upon the considerations of concentration of fire—upon a few ships; and upon dispersion of target—among several ships, or gun emplacements. A bigger ship has an evident advantage over a smaller, in a ship duel. In a fleet action, the bigger ship reinforces proportionately the position in the fleet in which she is placed. But it does not follow that in a combat of two ships against three, or eight against twelve, the same inequality continues. The dispersion of the target among twelve ships, the localization of a severe injury in one smaller ship instead of one bigger, the larger power of combination in twelve units over that in eight, all tend not only to compensate but to overcome the concentrated power (not concentrated fire) of the larger vessel, which is conspicuous in a ship duel.

The question ultimately is the difficult one of drawing a line. No one, for instance, wants one-gun ships, but a respectable school revolts at the twelve all-big-guns; and the revolt is greater when more are proposed with increasing size of vessel and reduced numbers in the fleet. Collateral questions arise, e. g., dockage for such vessels and their use of navigable waters. Already Chesapeake Bay is found too shoal for the increased draughts of battleships.

In conclusion, Sir William White mentions that the Japanese have not abandoned the secondary or intermediate battery. I believe that this is also true of the German navy, if not indeed of all save the British.

Prof. Hovgaard's Discussion.

PROF. WILLIAM HOVGAARD:—This paper puts the question of the armament of battleships in a remarkably clear way; it disentagles in an analytical manner the different factors which influence the problem, and makes it relatively easy to evaluate them and to assign to each of them their proper weight.

(1) *Disposition of Guns.*—I fully agree with Sir William White that when the end positions are utilized by placing two turrets at each end of the ship, mounted as in the Michigan, any further addition to the number of gun turrets is undesired, since it can only be made by sacrificing, to some extent, the arc of fire of such additional guns, and by incurring interference. The Michigan arrangement seems indeed the ideal.

On the other hand, it appears to me that if it is possible to design or rather to develop an efficient triple turret, this installation should be adopted. We shall thereby be able to mount twelve guns in one ship, all of which shall have the maximum arc of fire. At the same time all the advantages inherent in the Michigan arrangement will be retained, *viz.*: Favorable conditions for storage of ammunition, freedom from gun interference and facility of mounting a powerful secondary battery. The relative risk by thus concentrating three guns in each turret will not be greater than incurred by the twin turrets in the Michigan, since in both cases 25 per cent of the primary battery will be put out of action by the disablement of one turret, and the target presented by four triple turrets is smaller than that presented by six twin turrets.

The tactical concentration obtained by mounting, for instance, 24 guns in two ships instead of in three ships seems to me an undoubted advantage.

(2) *Anti-Torpedo-Boat Battery.*—If, in addition to the 6-in. guns, proposed by the author, a battery of lighter "man-killing" guns are to be carried, it appears to me best to place them on disappearing mountings, such as those designed by the Creusot firm in France, where these guns are lowered when not in use, so as to be sheltered by the side armor. The number of such guns must then be reduced, but it seems better to possess a smaller number of protected guns than a greater number of guns, which are almost certain to be demolished in ship or fleet actions.

(3) *Caliber of Guns.*—Even if it be granted that the technical difficulties, which stand in the way of increasing the caliber, may be solved satisfactorily, so that these heavier guns may be worked as quickly as the present 12-in. guns and so that they may have as long a life, it still remains to be proved, as pointed out by Sir William, that equally good or even better results cannot be obtained with 12-in. guns.

The heavy guns are, to my mind, essentially armor-piercers, and armor piercing can only be done by heavy guns. The larger guns now being introduced are, however, to be superior to the present 12-in. guns, chiefly in their greater shell effect, it being generally admitted that the armor-piercing effect of the 12-in. guns is adequate. Now. shell effect can not generally be expected to affect the vitals of a ship directly, its action is based on a demolition of unarmored or lightly armored

parts, and is essentially external. This work is indeed very important, but may perhaps better be carried out by a greater number of 12-in. guns which give a more widespread fire than by the concentrated effect of a smaller number of heavy guns.

The armor-piercing effect has much greater chances of reaching the vitals, of dealing deadly blows, and the greater number of 12-in. hits sums here preferable to a smaller number of say 14-in. hits, the individual effect of which is not much greater.

It must be borne in mind also, that with a given number and disposition of guns, an increase in caliber means an increase in displacement, and this leads up to the main point which I want to discuss, viz., whether such addition to the displacement and hence to the load carried is not much better employed in strengthening the torpedo armament and the protection against sub-marine attack.

(4) *An Increase in the Torpedo Armament of Battleships and in Their Submarine Protection.*—It will probably be objected by many, that it is of no use to fit a powerful torpedo battery in battleships, since future battles will be fought on great ranges. The torpedo is, in other words, regarded merely as a defensive weapon which, so it is thought, forces the ships to keep on long ranges. This doctrine of long range fighting, which has become so generally accepted during the peace period following the Japanese war, is not supported in a definite manner by the experiences of that war, it certainly breaks down in thick weather and under many circumstances, due to navigational difficulties. But also from a purely tactical point of view, the doctrine seems open to serious criticism. History furnishes an abundance of examples where similar theories have been exploded, both on land and sea.

The Tactics of Frederick.

Before the time of Frederick the Great, it was considered the highest art of strategy and tactics to try to secure secondary advantages by the occupation of outlying fortresses or territories of the enemy, by securing strategical bases and by overwhelming and defeating minor detached forces, while decisive action against the main army of the enemy was avoided. Frederick the Great broke entirely with this custom; he went right for the enemy's main army, fought it and destroyed it. He was severely criticized for this unscientific method by contemporary strategists, but he always beat his enemies. Precisely the same strategy and tactics were followed by Napoleon, no maneuvering about the enemy at great distance, but decisive blows at close quarters was his principle.

Nelson had the same principle. Before his time fleets would keep going at great ranges, sailing along parallel lines, firing for whole days at each other, without much result, but Nelson broke completely away from these tactics. Thus at Trafalgar he sent Collingwood right through the enemy's line, thereby exposing his ships to a dangerous fire, but gaining the decided advantage of afterwards concentrating a great force on a wing of the enemy at close quarters.

I do not mean to intimate that ships will fight at so close ranges in future battles as was the case at the time of Nelson, but it seems to me quite possible that commanders may be found who will prefer fighting at ranges of a few thousand yards, and who will use their superiority in speed, if any, in trying to close in with the enemy instead of running out to maximum range.

This seems the more likely to occur if we equip the battleships as I propose, by giving them, on the one hand, a powerful torpedo battery, and on the other a stronger underwater protection.

A Plea for the Torpedo.

As I have shown elsewhere (Jane's Fighting Ships, 1910), it is quite possible, on a displacement which is not now considered excessive, to endow a ship with a powerful armament of 12-in. guns, with a battery of some twenty-four submerged torpedo tubes and with a 4-in. underwater armor, placed externally on the bottom of the ship; the speed to be at least one knot more than the ordinary battleship speed. A battleship of same size of the type now in vogue, armed with a number of say 14-in. guns, but with only four to five torpedo tubes and with a relatively weak bottom, will stand very little chance of surviving an action at close ranges with a ship of the above proposed type.

I believe that the attention has been fixed too much on the artillery. In the struggle for the attainment of supremacy in this respect, it appears that the torpedo has been forgotten or put in the background.

The development has become one-sided and the result has been inharmonious designs, for while the modern dreadnoughts are extremely powerful in some respects, they are very weak in others.

Quite apart from the question of torpedo armament, it has become a necessity to give the battleships a much better protection against submarine attack than is at present the case. This is due to the fact that the torpedo itself, as well as the vessels which carry torpedoes as primary armaments and notably submarine boats, have recently developed to the point where the risks of destruction now encountered by battleships due to submarine attack are at least as great as those due to attack by artillery.

We should, however, never increase the weight given to the defensive in a battleship, without at the same time increasing the weight given to the offensive, and a more powerful torpedo armament is the natural correlative of the underwater protection.

Constructor Taylor's Discussion.

NAVAL CONSTRUCTOR, DAVID W. TAYLOR (communicated) :—The society is to be congratulated that the distinguished author of this paper should have enriched its proceedings with a contribution on a subject of vital interest to so many of our members and based upon professional experience unsurpassed by any naval architect today. If there are those among us who materially disagree with him on some points, they should be prepared to bring forward substantial facts and figures to sustain their position.

It seems to me, however, that the majority of the conclusions of the author will be accepted by those who have given much consideration to the subject matter.

Certainly, as regards the disposition of heavy guns, recommended, it cannot but be pleasing to the distinguished member of our society who was responsible for the bold departure taken upon the Michigan and South Carolina to find the author, not only endorsing it, but pointing out the fact that it has been largely copied in other navies. "Imitation is the sincerest form of flattery." I would like to point out, however, in this connection, that the "vertical echelon" disposition of turrets upon the Michigan and South Carolina was not adopted until careful and thorough experiment had shown its entire feasibility. The great question was, whether it would be possible to fire the two guns of the upper turret immediately over the lower turret. To determine this question, a 12-in. gun was mounted on the monitor Florida (now Tallahassee), so as to fire over the turret, and firing trials carried out, there being imprisoned in the turret, I believe, first cats and dogs, then midshipmen and so on, up to rear admirals. After the question of safety was settled, there were, of course, a number of other questions of prime importance, such as the provision of adequate strength in the supports of the upper turret, the sighting arrangements for the lower turret, etc. The results of target practice of the four vessels of the fleet now in service with the "vertical echelon" ar-

rangement of turret have been, I may say, very good, indicating that the many problems of the constructor and ordnance engineer involved by the new departure were successfully solved.

Favors the Michigan Arrangement.

The author believes in the four-turret disposition of the Michigan, as against five or six turrets, as found on later ships. This opinion is shared by many of the most capable and experienced officers in the United States service; but it is not possible to install the number of heavy guns demanded by the majority of our officers in four-gun positions unless we use three-gun turrets.

The author is not in favor of the triple-gun turret, although he does not take strong ground against it. He says, in effect, that only war experience could finally settle the question of its desirability. On this point, I would like to mildly disagree with the author, and record my opinion that war experience may be most deceiving. If we could have a war lasting several years, with a battle every month, the experience gained would, of course, be conclusive as regards practically all professional questions. But when there is but a single battle or two, at most, the elements of chance may very well entirely obscure the result as regards technical matters. We naturally draw as many conclusions as possible from the practical experience of war; but, I repeat, that results of a single battle may well lead us to fallacious conclusions.

The Passing of the Ram.

At the battle of Lissa, in 1870, the victors used ramming tactics most successfully, and, for years, every navy in the world attached great importance to the ram. When we undertook the reconstruction of the navy, about 1881, a number of rams were recommended by the first advisory board, and finally we built one upon the ideas of a most distinguished officer, completing it more than twenty years after the battle of Lissa.

By that time, however, the development of the gun and torpedo had practically wiped out the chances of successful ramming, and the experience of the battle of Lissa is not now regarded as warranting any importance being attached to the ram as a naval weapon.

It is very doubtful if it really warranted the importance attached to the ram during the few years immediately subsequent to the battle.

There is a good old English proverb, which, it seems to me, should always be borne in mind when we undertake to learn the "lessons" from a naval battle, namely "One swallow does not make a summer."

In his advocacy of good secondary armaments, the author takes strong ground on one side of a much debated question, and produces strong arguments for his contention.

Disposition of Secondary Armament.

There is no question that, today the disposition and protection of the secondary armament of a large battleship is about the most puzzling problem to be dealt with of the whole design, and happy the designer who has no secondary armament to contend with. In the Michigan and South Carolina, we had practically no secondary armament, because on the limits of displacement it was not possible to provide it, but we soon reverted to it.

Most nations have never given it up. England alone has practically left off a secondary armament from a number of ships. It is true that we call our secondary armament "anti-torpedo-boat guns," or some such name, but the fact remains that it is a powerful battery—the 5-in. guns we now fit being about as powerful as the 6-in. guns of a few years ago.

If we may judge the future by the past, the secondary armament will refuse to stay abandoned in any navy.

The English Dreadnought of nearly thirty years ago—the largest, fastest, most powerful vessel of her time, outclassing all others, had practically no secondary battery. About that time, the torpedo boat menace grew, and the secondary battery began. It was given a big impetus about 1884 by the destruction French quick-firing guns wrought in an affair with the Chinese, and the secondary battery grew and grew until a few years ago, it grew up to the primary battery. Immediately, however, the development of a new secondary battery began. There is little doubt that, whether logical or not, the secondary battery will persists, in spite of the difficulties connected with it, and the author's belief in 6-in. guns seems fully warranted by the almost universal practice of the present day. Indeed it seems very probable that even England will soon fall into line.

History Repeating Itself.

The statement on page 10, that "in many cases history has been repeating itself" appeals particularly to me. No one can study naval developments for even a few years back without finding many cases where naval opinion has swung around in a circle, and the author, with his experience of forty-three years, is doubtless able to recall a number of cases where the complete circle has been traversed more than once. While many naval officers are conservative, there is no question that naval opinion, as a whole, if reflected, as presumably it is, in designs of naval vessels—has during the last fifty years been in a constant process of change and re-crystallization in marked contrast to the conditions during the early part of the last century, and for at least two centuries before.

It may be interesting to recall that this period of shifting opinion is practically coincident with the development of the naval architect and marine engineer as more paramount factors in the design of naval vessels, and it might be maintained that the technical man is responsible for the incessant change in naval opinion, and not the traditionally conservative sea - going officer. (Applause.)

Admiral Capps' Discussion.

ADMIRAL WASHINGTON L. CAPPS:—It is to be regretted, I think, that officers of the ordnance and gunnery branch of the service are not here to participate in the discussion, as it deals with matters that particularly affect that branch of the service. It is also to be regretted that those of us who perhaps could speak with some authority on the matters treated are limited in the expression of our views by regulation. Some years ago, knowledge concerning naval development was much more freely disseminated. That period of ready access has been followed by one of comparatively profound secrecy. I say comparatively, because no matter how seriously you may attempt to keep things secret, those interested usually find out everything concerning them, and oftentimes you succeed in concealing a thing from your own people, who would doubtless profit by the knowledge, and those you desire particularly to conceal it from, have more or less complete information.

Sir William has very modestly stated that "no claim is made that new statements of the case have been embodied in the foregoing summary of points in favor of or adverse to the adoption of battleship armaments comprising a large number of heavy guns in each vessel. All that has been attempted is to bring such points into view, fairly and briefly."

Warship Design Subject to Varying Opinions.

I think, Sir William is to be congratulated on the very fair and impartial exposition of the case, and although he arrives at certain definite conclusions, and gives the reasons for those conclusions, I think his paper is one that can be read with the greatest pleasure, and with very little, if any, adverse criticism.

The subject of warship design is one that is necessarily subject to many varying opinions, and the opinion of the same individual is by no means the same today that it was last year. The most we can hope for is that those charged with the responsibility of design, shall give the matter their very best service, and that those who have anything to do with such material should give to those who have the immediate responsibility for design, the benefit of their experience in every way possible. By such means the results attained will be the best possible under the circumstances.

Sir William has made most graceful allusions to the work done in the United States in recent battleship development. Of course, whether or not he is right in his tribute, must be left to others. I think, however, that all of you, as not only members of this society, but as citizens of this country. are especially interested in knowing with what care we have adopted certain principles of armament, which it is gratifying now to know have been very largely followed by our colleagues in other countries.

Middle Line Emplacement.

Sir William has stated, and I believe he is correct in the statement, that the South Carolina and Michigan represent the first groups of ships of this particular period, embodying the old middle line emplacement for heavy guns, and particularly the special form of emplacements of the turret—that is, No. 3 firing over No. 1, and No 2 over No. 4. This emplacement was not arrived at in any haphazard way; it was a matter of considerable improvement, and the time is now past, and so much publicity was given to many of the details, that I am sure I violate no confidence in giving you a brief indication of a few of the steps taken by the department before accepting and adopting that form. It had been contended by many that that system of mounting was entirely impracticable, and would prove so in service, and that while the material might stand the blast of the upper tier of guns, the personnel could not. Many experiments were made, first on shore, and subsequently by a mounting of guns exactly simulating the actual mounting which would take place on board ship. We began in a modest way with animals, with pressure gages, and then developed the full pressure by putting into the turret at the place of maximum danger, the men who were really responsible for the design. (Laughter.) Those gentlemen had witnessed all the experiments, of course, but from a comparatively safe bomb-proof location, as did all the others, but on this occasion, they had such great confidence that they went in and were promptly followed by many others, of course, and were then in position to say that it was an entirely practical arrangement and that the guns could be fired under the most disadvantageous conditions, and with practical safety and comfort to the men in the lower turrets. That in brief, is the procedure that the naval department adopted before accepting that form of mounting.

Our Development Has Been Continuous.

It is also gratifying to note that our development along that line has been quite continuous, and although our ships have varied in size and the number of guns, the principle then demonstrated has been maintained; and other very important naval powers have come to accept that principle also as being one of the best, at any rate.

I almost feel like apologizing for making this allusion, because it concerns matters in which I have had some considerable personal interest, but every one now and then reads very adverse comments about the naval material for naval purposes, and it is somewhat reassuring to know that our progress is being watched, not only with interest, but with a certain degree of expectation by other countries.

I should not attempt, for any instant, to go over the many interesting points raised by Sir William. This sort of paper is one which should bring forth a most useful forensic display from a great many interested sources, and I sincerely trust, for the information of those responsible for designs, for the information of all of us, in fact, that the written discussions of this paper will be very complete, as it will unquestionably add greatly to the value of our proceedings.

Marvelous Advances in Gunnery.

One comment made by Sir William struck me as exceedingly interesting. It is one that has been discussed before, of course, but one to which I do not think sufficient attention has been paid. We all know the marvelous advances made in gunnery during the last few years. To those who do not have access to official records, this progress is almost phenomenal. It is only a few years ago that 2,000 yards was accepted as a very reasonable battle range. We have gone now up to 7,000 and 8,000, and even to 10,000 yards and more. There is one important condition, however, that is often overlooked, in assuming that actions will take place at such long ranges, and that is a condition which no one can control, and the ill effects of which are very frequently the case in actual battle; that is, atmospheric conditions. In one very important body of water in the world, it is the rule rather than the exception, that you cannot see 2,000 yards away. It frequently happened on our own coasts that the atmosphere is so hazy that you cannot observe accurately 5,000 yards away. These atmospheric conditions must have a very important bearing on the range at which battles can be fought, so that any one who assumes that an arrangement of armament, which provides for a very long battle range, is absolutely the right one, because we will have long battle ranges, leaves out of account the important consideration. Also we have made very great strides in naval material, and I have very great faith in later developments of big-gun-ships. I am not one of those who consider that all preceding designs are worthless. Very far from it. In the event of battle, both in the main lines and in the reserve, the ships that preceded the old big-gun-ships, even will give a very fair account of themselves. So I do not think we need dismiss that branch of our service as being completed and without use.

Personally I feel very much indebted to Sir William for presenting his views in so concise and impartial a manner, and I regret that limitations imposed upon us prevent any very detailed discussion of the paper, or the presentation of facts deduced from our own professional experience.

Constructor Linnard's Discussion.

NAVAL CONSTRUCTOR, JOSEPH H. LINNARD:—Mr. President, most of the points I had thought to make a comment upon, have already been touched upon by the previous speaker, but it may be said that the paper is largely a protest against the tendency of the battleship's design. I think we all have to admit that there are fashions in ships as well as in other things, and those who protest against the fashions, are apt to find their argument, however well considered, fall frequently upon deaf ears. Fashion, although sometimes based in part upon reasoning, is also largely based upon pride. Now, that fashion in warships at the present time indicates larger displacements. No nation is willing to take a battleship that displaces less than the contemporary battleship of other nations. Nor is it willing to have a battleship of less speed, nor is it willing to have a battleship that has apparently less guns on it. The point which seems to draw least attention in the modern fashion is the question of protection, of which Prof. Hovgaard has fully spoken. Yet, to

some of us that very question of protection seems to be the one, in which, if we are to have a fashion, the fashion should be protected.

Limitation in Number.

The tenor of Sir William's argument is the limitation of the number of guns devoted to a single ship, and this naturally falls in with the point of view of those who believe in greater protection. If we agree that displacements cannot be reduced, we can put our capital represented by displacements in armament protection or speed; and, as Prof. Hovgaard very justly remarked, it seems to many of us that we have balanced in our modern ships the part devoted to each of these features. If then, we limit the amounts devoted to armaments by reducing the number of guns, or by limiting their size, we can devote our large ship more to protection.

In the spring meeting of the British Institution of Naval Architects, a paper was read, in which the writer indicated his belief that the tendency would be to reduce protection and to increase very greatly speed, and perhaps armament; and this may be the tendency of fashion; but if the views that have been so strongly presented here this morning carry weight, it will not be the tendency of the fashion, but the fashion will be towards that of increasing protection rather than increasing armament.

Guns on Center Line.

The disposition of guns upon the center line exclusively has been touched upon by previous speakers, but the alternative arrangement by which at least a pair of turrets are placed upon the sides of the vessel, has been strongly advocated by many on the ground of increased end-on fire, which some consider extremely necessary. Even if one grant the desirability of increased end-on fire, it has never appeared to me that the arrangement of side turrets accomplishes the results desired. If we take the fire directly forward, as exemplified in the South Carolina-Michigan design, we are able to fire without danger, as has been explained by Admiral Capps, four guns directly ahead. Nominally, we are able to fire six guns directly ahead, with three turrets arranged one in the center line, and two on the sides; but I believe I will be sustained by officers who have managed battles and turrets and gun-fire, that this is not a practical proposition. In other words, a ship cannot be steered exactly to an object—the cartridge or the enemy—and will, even if it is approaching directly, sheer off to one side or another in its progress. Now, it takes but a very small angle in any of these arrangements with side turrets, to blank one turret or the other, so that for all practical purposes, the center turrets and the turrets on one side or the other are the ones that are fired, but not both of the side turrets in the circumstances in which ships are steered at sea; and even momentarily if we can fire the three turrets directly forward or aft, it is obvious, in an attack at least, that position cannot continue any length of time without bringing the two enemies—the ships opposing—in contact, and hence can but momentarily exist. The question of secondary batteries is somewhat complicated by the progress in size and weight of guns with nominally the same caliber, and it may be said that the latest 5-in. guns we are using on our ships have practically the same weight as the 6-in. guns of an earlier date; so that the 5-in. guns we have mounted may be in a way practically described as 6-in. guns with a 5-in. hole in them, and we consider such guns mounted in positions in which they can be used in action against other ships, it seems sufficiently obvious that no commanding officer will refuse to use such guns in an action, because they are denominated anti-torpedo guns; if he is able to fire them, he will use them against an enemy. And it seems the part of wisdom if such is the case, to make such guns of at least such a caliber and weight that they will be effective guns on the enemy.

A vote of thanks was tendered to Sir William White for his paper.

The History and Economic Value of Canals

THE second paper read was Commodore J. W. Miller's paper on "The History and Economic Value of Canals, with Special Reference to the Cape Cod Canal.' The character of the paper is justly indicated in the title. Com. Miller told the history of canals from the days of Rameses to the present. From an engineering point of view, the problem of the Cape Cod canal is not great. The total length over the isthmus is eight miles. The total length to 30-ft. depth in both bays is 13 miles. The soil to be cut is sand and amounts to 17,000,000 cu. yds. The deepest cut is 29 ft. above tidewater. The channel at both ends of the route, the natural marshes and streams already furnish a waterway for boats of light draught. The difference in tide between the two bays necessitates no locks. The depth of the canal is to be 25 ft. Minimum width of bottom 100 ft. through the central portion of the canal; this will give a surface width at the narrowest point of 250 ft. The approaches will have a minimum bottom width of 250 ft. The bridges, however, are being constructed on the basis of an ultimate depth of canal of 34 ft.

Discussion of Com. Miller's Paper.

CAPT. THOMAS I. MILLER:—Mr. Chairman, I would like to ask a question or two about a point that I consider important, and that is as to the prevalence of fogs in the upper part of Buzzard's bay as compared with the Nantucket shoals. Additional lighthouses and lightships will be required to make that passage comparatively safe.

COMMODORE J. W. MILLER:—Answering that question, I would say the fogs are very much less dense on Buzzard's bay than they are on the Sound and less than they are at Cape Cod; but notwithstanding that, there is no doubt it is a very foggy region. We are now in communication with one of the electric light companies in this country to lighten that canal every 400 ft., or to make a street of it, because we appreciate this is not only a canal, it is a very narrow strait connecting two important waterways, and the only way we can make it attractive is to make it as clear at night as it is by day, and the success of the canal will depend a great deal upon its operation at night, and the plan those people show today is a plan of lighting exactly as you would light a street on shore.

E. P. STRATTON:—Mr. Chairman, there is one question I would like to ask on the depth of water in this canal, 25 ft., it seems to me that is a depth that hardly meets the requirements of our battleships, and I notice that Capt. Miller has referred to the fact that the bridges over this canal have a foundation extending over 30 ft. over the water; hence I am inclined to believe that it would be desirable if that depth of 25 ft. could be extended. The Panama canal has 40 ft. of water, and as this canal will certainly have to accommodate a large majority of all the traffic passing by sea from Boston to New York and vice versa, I think the promoters of this enterprise should seri-

ously consider the draught of at least 30 ft.

EDWARD C. BATES:—Mr. Chairman, the writer has referred to De Witt Clinton and Robert Fulton in a general way in this paper. I have heard it stated that Robert Fulton was a designing engineer for De Witt Clinton in the laying out of the Erie canal. I have never come across any such authority myself and I would be very glad if any member here would communicate it if he finds any such authority. Robert Fulton, I believe, died nine years before the canal was opened, but, of course, it was under consideration some twenty years before.

CAPT. J. W. MILLER:—Mr. Chairman, answering the question that has just been brought up, I will say that matter of depth has had very grave consideration on the part of the corporation, of which I have the honor to be vice president. It is a commercial corporation. Twenty-five feet at low water was decided to be all that was necessary for all the commerce of the United States. It will take in every ship that now plies along the coast of the United States. Therefore, from a financial and a commercial point of view, we did not see that we should go any further than we have. We are building, may I say incidentally while other people are attacking and asking for government help, here, there and everywhere, we are building the Atlantic coast canals ourselves with our own money, and we are going to put in anything that is necessary for the merchant marine of the country and this coast. We can scarcely be expected to spend so many millions more for the difference between a 25-ft. canal and a 30-ft. canal for the benefit of the United States government. We are ready to listen to any proposition that the United States government may make, but we are not going to the United States government and asking them for anything.

Needs of the Navy.

If you ask me here, as an ex-officer of the navy, what I think on that subject, I will answer it in a very different way. For eighteen years I have been in the navy, and would say from a naval point of view that is no place for a battleship. The province of a battleship is off shore. These vessels that draw 30 to 40 ft. of water want to keep outside of the land and fight their battles outside. But with that deep insight my chief has, and also seeing that the times may change, we are building all our bridges and everything—with the bridges deep enough and the wharfs far enough back from the side of the canal so that eventually if the government wants 34 ft. of water it can have it.

Notwithstanding what I have said about that not being the proper place for a battleship, I want to lay before you, as a naval officer, this fact. There are four great strategic points, Chesapeake bay, New York harbor, Narragansett bay and Boston. If squadrons in time of war should be in each one of those harbors, and there should come a critical moment when a large fleet should appear off this coast, it might be of the highest importance to unite the fleet in Boston or Chesapeake Bay or in New York harbor, by means of the canal; and the cost today of deepening that canal to 34 ft., which would probably be from one to three millions of dollars, would be nothing to the insuring of a victory by the uniting of those squadrons. I might add that to deepen that canal from 25 to 34 ft. would cost the government absolutely not one single cent provided the survey which is now being made for deepening the shoal around Cape Cod would be extended. The deepening of that shoal will cost the government half a million of dollars, and will not last five years.

Adjournment was then taken for luncheon.

Evolution of Screw Propulsion in the United States

PRESIDENT Taylor called the members to order at 2:30 o'clock. Immediately upon convening, W. D. Forbes read Charles H. Cramp's paper on "The Evolution of Screw Propulsion in the United States." This is a continuation of the paper read at the 1909 meeting and opens with a discussion of the American clipper and larger paddle wheel steamers. The author continues:

As soon as the civil war had begun, shipbuilders began to replace some of the vessels taken by the government and devote their energies to contracts with the government for navy and transport services. The navy department concluded to build a number of armored vessels. Congress made an appropriation and Commodores Smith, Paulding and Davis were appointed a board to carry out the purpose. They advertised for proposals, to be accompanied by full specifications and drawings, and also prices.

The advertisements were responded to by about 30 proposals of the most extraordinary and outlandish character, and three of the great builders from New York proposed to build a ship for a certain sum of money, without a single drawing or scrap of specifications as to dimensions, material or performance accompanying them.

New Ironsides.

The only complete proposition accompanied by drawings with full specifications as to dimensions, and with size of armor, speed and time for completion presented, was that of the New Ironsides, which we furnished, and it was at once accepted, and as the price was less than the appropriation, the board decided to accept the two other propositions, whose sketches and details were fuller than the others. The cost of these ships completed the appropriation. They were those of the Monitor and Galena, and the object of the board, as they stated it to me, in taking them was in the way of an experiment. All of these vessels were propelled by screws.

The contract for the New Ironsides was in the name of Merrick & Sons, who furnished the engines and armor. At that time, engine building was not included in any of the shipbuilding works. The suggestion that we should join in their proposal was made to me by B. H. Bartol, superintendent of Merrick & Sons.

The building of the New Ironsides, Monitor and Galena was an event that led to the effectual and final destruction in this country of the great shipbuilder, whose career and occupation had been so distinguished in connection with the great packet and clipper, and had covered him with so much glory. I refer to the commonplace, but important incident of the battle between the Monitor, with Timby turret, and the Merrimac.

The Monitor was built by parties that were neither ship nor engine builders, and the workmen were very inefficient and the work was done from imperfect sketches. During its construction we were requested to send men over to bend the keel pieces, which were dish-shaped and bent hot, and other matters of difficult workmanship.

This victory over the Merrimac was the cause of one of the greatest excitements in shipping circles that the world has ever witnessed. Ericsson, with all of the officers who were on the Monitor during the fight, became the subjects of the most extravagant demonstration of hero worship. The Monitor craze carried everything before it, and Capt. Fox,

the able assistant to Secretary Wells, was compelled to order a number of monitors, to the exclusion of everything else, notwithstanding he was not affected by the universal "craze."

The drawings furnished contractors for machinery of Ericsson's own design were mere sketches, and he never could be induced to look at the completed drawing of a contractor nor look at an engine in the course of construction. This was looked on and repeated as an evidence of his greatness. This practice was a cunning resort of his to shift the blame on others if anything wrong happened, or the engine did not function properly; he always claimed that his drawings were not adhered to.

The First Screw Tug, the Sampson.

The New Jersey,* with Ericsson engines and crew, was engaged in towing on the Delaware, and was being repaired at Reaney & Neafie's.

Michael Malloy, who was engaged in towing vessels to a point below the Horse Shoe on the Delaware with old ferry boats, after witnessing the work done by the New Jersey, and with our recommendation, concluded to build one to do her work. We built the Sampson for him, of wood, and Reaney & Neafie built the engines. She proved a success and Mr. Malloy parted with his old ferry boats, and all others in Philadelphia, who followed towing, did the same. The Sampson was the first screw tug boat built in this country, and in connection with Reaney, Neafie & Co., we built a large number for all parts of the United States.

After building the Lehigh, we built the iron hulls of several unimportant vessels, when we joined Neafie & Levy in the construction of a good sized ocean screw steamship, for sale. Thomas Clyde joined in the scheme and secured her when finished at the prices fixed; her name was the Clyde.

After that we concluded to add engine building to our plant, and we secured the services of J. Shields Wilson, referred to in Part I, as the engineering head. The time was very favorable, as the great question of the use and utility of compound engines had begun to agitate the engineering world.

Mr. Wilson, who at that time was the ablest marine engineer in the United States, had interested himself at the very beginning of the agitation, had followed it up and had become so much convinced of its merit that we prevailed on Mr. Thomas Clyde to make a beginning, and he contracted with us to build the George W. Clyde, the first ship built in this country with fore-and-aft compound engines.

*See Part I, Transactions 1909.

The success of the experiment on the George W. Clyde was greater than we expected, and we concluded to build compound engines and not consider any other type in our business as builders of complete steamships.

Pennsylvania, Ohio, Indiana and Illinois.

When a new Philadelphia company was started, in 1871, in connection with the Pennsylvania railroad, to build a line of steamers to Liverpool, Mr. Bartol, on account of his business ability and his experience in steamship matters, particularly in matters relating to engineering, was made a director of the company and chairman of the committee to provide for the new ships.

The building of these four iron ships, between 1873 and 1874, was an event of much importance, particularly as the ships were propelled by screws and the engines were of the John Elder type of compound engines. The ships were subject of much consideration on their arrival in Liverpool, many of the principal shops sending their draughtsmen to look up the flanging in the boiler heads and fire boxes of the boilers; no flanging of these or any other part of a boiler had been done before in Great Britain.

Discussion on Mr. Cramp's Paper.

W. I. BABCOCK:—I think it is somewhat unfortunate that Mr. Cramp has not given any date in his paper. He speaks of a good many old vessels, but it would be much more valuable if he had given absolute dates. He says on page 5 that the Sampson was the first screw tug boat built in this country, and that he built the Sampson, but he does not say in what year.

I have a letter here from one of the members of this society, J. J. Lynn, and he has asked me to read the following:

> "It may be of interest to have you mention that it is a question if the Sampson was the first screw tug boat, the Reindeer having preceded her by three years. The Sampson was well known on the lakes, if this is the boat that Mr. Cramp refers to. The machinery was built in Philadelphia, and she was said to have come from the salt water. I would imagine that she was about 125 ft. over all, 19-ft. beam, and 10½-ft. hold. She was a straight low pressure, and in her day was called lazy, principally because she worked condensing and made no fuss as the other tugs did, consequently she was unpopular and her work was confined to towing rafts and barges. At this she was a marked success, because she carried the largest amount of fuel of any of the tugs then in operation.
>
> "The Reindeer was brought here from Lake Ontario by Captain Sim Keeler, who afterwards took her down to the St. John's river, Florida. Her engines were double-cylinder, oscillating, on an incline of 45 degrees, and had an externally-fired boiler, with the boiler set in brick work and the flame passing along the shell, thence through the flues and stack, into the atmosphere. I recently talked to an engineer who was aboard of her when she was in service here, who claims that she was an older boat than the Sampson."

Discussion by Edwin W. Hyde.

EDWARD W. HYDE:—I have a short contribution to this subject, Mr. President. It is a contribution to the early history of screw propulsion. I submit the following: In 1844, there was organized in Bangor, Me., the Bangor Navigation Co., having as its object the building and operating of a steamer between that port and Boston, the following named persons forming the company: Joseph Bryant, Jacob Drunnond, Albert Emerson, E. C. Hyde, James Jenkins and Edward E. Upham. One of the company having been appointed manager, he was sent on a tour of observation down the coast, and after having looked over the steam navigation field of that day and visited several shipyards, he strongly recommended building an iron steamer, propelled by twin screws, as being the most suitable for the service. Acting upon this advice, a contract was made with the firm of Betts, Harlan & Hollingsworth, of Wilmington, Del., for a vessel of the following description:

Length, water line, 125 ft.; breadth, 23 ft. 6 in.; depth of hold, 10 ft.; rig, three-masted, fore and aft schooner with bow-sprit and standing gaffs; machinery, twin screw, consisting of two single engines, 22-in. by 24-in. cylinders; one drop flue boiler; stateroom and berth accommodations for about 150 persons; the keel was of 7/16-in. plate; hull plating, ¼ in. to ⅜ in. thick; frames, flat bar iron, 3 in. by ¾ in., spaced 20 in., to which the plating was secured by U-shaped clips, or keepers, 1 ft. apart, riveted to the plates; the price of the hull, based on a weight of 94,447 lbs. at 9¾ cents per pound, was $9,208.58; price of machinery, $7,650.00.

Separate contracts were made for carpenter and joiner work, rigging, painting, etc. The total cost of the vessel, ready for sea, was about $21,000.00, an itemized bill for which, submitted by the builders, is in the possession of the writer.

The propellers were 8½ ft. diameter

of the Loper type, for the use of which the patentee was paid a royalty of $330.00. The increased cost of living seems not to have obtained in the matter of propeller wheels since 1845.

The vessel was about seven months in building, was named the Bangor, and at a builder's trial on the Delaware, July 25, 1845, showed a mean speed of 11.56 miles per hour, with steam pressure of 46 lbs.

She then went on the route between Boston and Bangor, and on her second trip, when entering the Penobscot river, fire was discovered in the cargo, which spread rapidly to the woodwork of the vessel, which was entirely destroyed. She was beached as soon as possible after discovery of the fire and no loss of life occurred. The finances of the company did not survive the wreck, and the boat was floated and rebuilt by other parties and taken south, where, under the name of "Scourge," she was used by the government as a transport in the Mexican war. At the close of the war she was sold in New Orleans, after which time all record of her seems to have been lost.

E. P. STRATTON:—Mr. President, I think there is an error in the statement that Mr. John Roach was a boilermaker; he was not a boilermaker, he was a founder of world renowned fame.

Discussion by W. Conant Church.

W. CONANT CHURCH (communicated):—In Mr. Cramp's excellent paper I find him saying: "This victory over the Merrimac, coming as it did while the whole country was aroused over the sinking of the Congress and Cumberland, was the cause of one of the greatest excitements in shipping circles that the world has ever witnessed. Ericsson, with all of the officers who were on the Monitor during the fight became the subjects of the most extravagent demonstration of hero worship. The Monitor craze carried everything before it, and Capt. Fox, the able assistant to Secretary Wells, was compelled to order a number of monitors, to the exclusion of everything else, notwithstanding he was not affected by the universal 'craze.'" Mr. Cramp further says:

"The drawings furnished contractors for machinery of Ericsson's own design were mere sketches, and he never could be induced to look at the completed drawing of a contractor nor look at an engine in the course of construction. This was looked on and repeated as an evidence of his greatness. This practice was a cunning resort of his to shift the blame on others if anything wrong happened, or the engine did not function properly; he always claimed that his drawings were not adhered to."

Mr. Cramp in Error.

As to these statements, Mr. Cramp has fallen into error, doubtless because of imperfect information. I found among the papers of the late John Ericsson, to which I fell heir, letters from Gustavus V. Fox, extracts from which will enlighten Mr. Cramp on the subject. June 18, 1862, Mr. Fox wrote a private letter to Ericsson, saying: "The secretary has today decided to let you build two vessels of the big class—one of one turret and one of two turrets. I am sorry it is not four, but if no new plans are presented within a few months, it may be considered by him desirable to build two more. The official letter will go to you at once for two."

Writing to Ericsson, Aug. 5, 1862, Mr. Fox says of the monitors: "Nothing that has been presented approaches them in value. The Galena and Ironsides are the work of the blacksmith; the Monitor a piece of delicate, perfect mechanism. Your associates have nearly five millions worth of work, and the public, whom we serve, expect other work to be scattered. For yourself, with your patriotic impulses, the establishment of your system must be your greatest reward. People incapable of making one of your ships are begging, beseeching, and demanding one. We propose to advertise, say for a class of vessels like the big monitor, Quintard's vessels, and the new monitors, to be built on the Atlantic or Western waters. Will you help us by furnishing drawings, etc.?"

Excerpts From Fox's Letters.

Writing four years later, April 23, 1866, Mr. Fox said to Ericsson: "The country never can and never will do you justice pecuniarily for the inventions which have been so useful, and which have realized the creations of imagination, and which are the results of genius in comparison with other systems which are born of labor and art and long study. Your reward cannot be counted in gold and silver, or income; it is immortality and your own happiness at success. Nevertheless, you will, I trust most sincerely, have all you desire here in this life. I need not assure you how confidently I believe that the raft principle will prevail for iron-clads, and I should like to see it tried for passenger steamers. The victory has come to you at last through the trials all must go through."

The confidence Ericsson had inspired at the department, among those who were not influenced by professional prejudice, is shown by a letter of June 9, 1862, from Mr. Stimers, who said: "You will not be interfered with in your arrangements. The secretary and Mr. Fox have the greatest confidence in your skill and uprightness."

Writing to congress concerning a memorial presented by Ericsson, Secretary Welles said: "The memorialist has been a public benefactor, and in the fullness of his patriotic zeal has freely given to his country the productions of his genius and the labors of a remarkable mind. In doing this, and in undertaking to furnish the government with vessels that would give it maritime supremacy, he does not appear to have been influenced by pecuniary motives. His work has been well done, and is worthy of the government and his country."

Ericsson's Attitude Toward Critics.

I am sure that Mr. Cramp will be glad to accept the evidence these extracts from letters by Mr. Fox and others afford that he has fallen into error in the statements from his paper quoted above. That Mr. Fox's faith in the Monitor underwent no change is shown by a letter written by him in 1869, in which he said: "Navy officers in our service and the English will advocate a broadside system—such was the English report—or at least connecting the turrets by casemates, and such would have been a report of our own had we put the monitor system into their hands. It arises from education in broadside ships and the instinctive appreciation that their own position will be shaken if fighting ships are reduced to machines, the product of engineering skill. Porter is desirous of having the satisfaction of building up a navy founded upon his own ideas and English precedents. He will not follow in the wake of those who preceded him, but throwing all experience overboard, even his own endorsements, he assigns to the Monitor shore duty and tonnage of 800 tons and to his invulnerable sea steamer only 3,300 tons. He will learn that invulnerability cannot be reached in the latter tonnage by any other type than the monitor."

Ericsson's Mechanical Drawings.

Ericsson's attitude toward his critics is shown by a letter written ten years after the civil war, in which he said: "In reply to your kind letter, asking for a copy of acknowledgements received complimentary to what you are pleased to call my great work, I beg to state that nothing could induce me to lay before the world the approving opinions of the monitor system without also presenting the adverse criticisms of my work, which learned, as well as skillful, practicall men have written in great numbers."

Mr. Cramp's statement concerning the incompleteness of Ericsson's drawings of

his designs is very contrary to the impression I derived from an examination of the vast mass of mechanical drawings turned over to me by Ericsson's executors after his death. Certainly, when in his youth, he was a draughtsman in the employ of the Swedish government, he was so skilled that he was entered upon the pay rolls under two names and drew two salaries. I think Mr. Cramp should furnish some evidence in support of his statement that Ericsson's "practice was a cunning resort," etc. This may accord with the opinion of Ericsson entertained by jealous rivals, but it is entirely out of keeping with the character of the man as he was. As to this without occupying too much time with a matter aside, I can only interpose a positive denial of the correctness of the statement quoted; a denial based upon an acquaintance with the professional and personal correspondence of John Ericsson extending over most of his lifetime. In this I find no suggestion by way of complaint or otherwise in support of Mr. Cramp's criticism.

As to the "Monitor, with the Timby turret," the only resemblance of the Timby turret to the Monitor was in the fact that Timby and Ericsson, in seeking to provide an all round fire, both adopted a device as old as the days of Greek and Roman warfare. A Monitor with a Timby turret would have been an impossibility. It is absurd to charge the author of a hundred patented inventions, and the designer of a vessel requiring some forty devices so novel that they were also patentable, with depending for his fame upon the device of a single chance inventor. The Timby turret has never been used anywhere, while the device of a vessel bearing a Monitor turret has revolutionized the navies of the world. After going through a cycle of change, such as Capt. Fox predicted, naval designers now show a tendency to return to the simplicity of the original Monitor. Had they adhered to it, with modifications required to meet the changes in guns and powders, what an enormous amount of public money might have been saved.

Discussion by H. Penton.

H. PENTON (communicated):—I think it is a matter for regret that the author's remarks on pages 3 and 4 of this paper with reference to Ericsson should become a part of the records of this society. I have in my possession copies of some of the original sketches submitted by Capt. Ericsson to the navy department, together with some of the accompanying correspondence, and it seems clear that not only is Mr. Cramp in error, but also that all the credit which has hitherto been so freely accorded Ericsson not only in the United States, but also in Europe, was his by right, and that we should not, because of the rapid contemporary evolution, countenance reflection upon his memory.

It may be true that the Monitor was built by parties who were not experts in shipbuilding; it will be remembered that experts in iron shipbuilding were not numerous anywhere at that time, nevertheless, they undertook something which those who passed as experts shrank from, and the results are now matters of history. Details of construction are still matters of controversy, as the Transactions of this society bear witness.

As to the adulation which followed, we are not guiltless of it even in these latter days when we have had no great national crisis confronting us. The members of the society who attended the summer meeting at Detroit last year had an opportunity of judging in the Don Juan de Austria of the freedom with which praise or criticism is bestowed. As to iron shipbuilding, it may be repeated that the Monitor was antedated even on fresh water by over 20 years, and there are still running on the great lakes, screw ships with compound engines that antedate by many years the American Line ships referred to, and it may be interesting to note in this connection that some of these ships, built as long ago as 1862, still retain their original boilers.

Mr. Cramp is very much in error in his statement that the Sampson was the first screw tug built in this country, if, as may be inferred, she followed, or was contemporary with, the Monitor. Of course, there were numerous screw propeller ships in service in the forties and fifties, but I understand Mr. Cramp makes a distinction between these and tug boats.

B. H. Bartol in *A Treatise on Marine Boilers of the United States* (Philadelphia, 1851) refers to the tug boat Rescue, built for New York harbor service and engined by Reaney & Neafie. He gives her dimensions as: Length, 106 ft. 6 in.; beam, 20 ft.; depth of hold, 9 ft.; tonnage, 173 (presumably gross). She was fitted with a double vertical inverted simple engine with cylinders 26 x 26 in., driving a four-bladed propeller 8 ft. 2 in. diameter, 18-ft. 6-in. pitch, with a developed blade area of 56 sq. ft. The average revolutions are stated to have been 56 per minute with steam at 35 lbs. and cut off at 11½ in.

Accurate records of early steam vessels are somewhat difficult to obtain, but the oldest list I have at hand shows that the screw tug Witch of the West was built on the great lakes in 1856 and the L. L. Lyon in 1857. There were doubtless many others, even earlier, of which records are not now available.

THE CHAIRMAN:—Is there any further discussion upon this paper? I think there are one or two other errors in the paper, which I have not read until this moment. "The Monitor was built by parties that were neither ship nor engine builders." Thomas Rowland, who built the Monitor, was originally an engine builder. I know he was concerned in a shipyard that built the City of Boston and City of New York;. so I think, as a single statement, that this is an error that can be easily verified and corrected, if necessary. I will see that that is done.

Floating Dry Docks in the United States

THE next paper read was W. T. Donnelly's paper on "Floating Dry Docks in the United States; Relative Value of Wood and Steel for Their Construction." There are 91 floating dry docks in the United States, of which three are of steel and one with steel wings. The only steel commercial floating dry dock is that of the Great Lakes Engineering Works, at Ecorse. After comparing a steel floating dock of 20,000 tons lifting capacity, which he designed, but which was never built, with similar docks with wooden pontoons, the author concludes as follows:

"All the writer's experience with floating dry docks and their construction and repair, leads to the firm conclusion that for underwater work, such as pontoons for the Rennie type of dock, wood is a much superior material of construction to steel, that the original cost is much less, the cost of maintenance less, and the life of the structure greater than steel. For the wings and upper work experience is equally conclusive for the use of steel. While it is apparent that the cost of maintenance will be considerable the structure will last much longer and with a sectional pontoon dock, where the wings are accessible at any

time, and any portion of the wings may be entirely replaced if necessary, it would seem that the structure as a whole will last indefinitely.

"A comparison of the materials used for wooden and steel pontoons shows that the weight of the steel per hundred tons of lifting power is 33 tons and the the weight of wood per hundred tons of lifting power is 36 tons. It is evident that the difference in weight must be supplied by increased dimensions of the wooden pontoons. Other than in this particular wood appears to have the advantage in every way."

Discussion on Mr. Donnelly's Paper.

PROF. CECIL H. PEABODY:—I think it would be better to let this pass as if there were no discussion, because we can make no objection to the information given us.

HORACE H. THAYER JR.:—If it is in order, I would like to ask Mr. Donnelly what his idea is in regard to a composite pontoon.

WILLIAM T. DONNELLY:—I would like to state that that matter has received considerable attention at times by myself. I have always found there was a very great difficulty in making the contact between the steel and wood. If we limit the amount of steel in direct proportion to its strength, we find that the bearing on the wood will not be sufficient; the pressure brought to bear would crush the wood. Another thing, in the contact of wood and steel—the steel in such cases suffers a very great deal, there seems to be an increased rusting between the steel and the wood. In the matter of contact in steel pontoons, it was taken up carefully, and taking the experience of the John H. Robins Co., it was considered as a serious problem, the contact of the wood and the steel, that the corrosion would not be too rapid; we added to the plate of the steel a plate to provide for the possible contact, and then eliminating the contact as far as possible. Then we found even that there was an unwarranted amount of corrosion and deterioration of the steel. I am aware that there have been quite a number of composite pontoons built of this kind, but I am not aware of them practically, and I would be glad to have anyone give his experience in that respect.

A. C. CUNNINGHAM (communicated):—In the combination of wooden sectional-pontoons with steel side walls, Mr. Donnelly has secured a floating dry dock of comparatively low first cost, and moderate costs for maintenance and repairs. These are essential features in a commercial dock which, to be a success, must give a good return on the investment. A commercial dock must be out of commission as little as possible, and Mr. Donnelly's combination also tends to this condition. To prevent serious deterioration, a dock with steel pontoons must be self-docked at reasonable intervals for cleaning and painting. With wooden pontoons, these intervals can be much longer, as there is no rusting to contend with, and by keeping the wooden pontoons wet, the rotting of the wood can be prevented. The steel side walls can always be preserved in place without disabling the dock.

Permits of Greater Capacity.

The combination also permits of a dock of much greater capacity than in wood alone. The pontoons become merely beams for transmitting the weight to the side walls, and when of steel, these can be designed and constructed to take any stress safely. There would probably be found a point where steel pontoons would be more economical than wood in first cost, but it would be considerably beyond the capacity of a purely wooden dock.

If a dock with wooden pontoons were located in water where the teredo is plentiful and active, some attention would have to be given to the protection of the wood from the inside of the pontoon, especially if there were periods when the dock was inactive. The new graving dock at the Norfolk navy yard was flooded for several months before the caisson could be placed and the dock pumped out; the oak keel blocks had been placed in the dock by the original contractor, and when the dock was pumped out, it was found that the teredo had cut into the blocks about 1 in. The greatest danger for the wooden pontoon would be at the bottom, where there is always water, and this would also be the hardest place to inspect.

Mr. Donnelly's link and wedge-pin connection between pontoons and side walls is extremely simple, rapid and effective. If made from steel, they are presumably forged from the solid and have no weak point. By making them of soft steel and finally quenching in oil from a dark cherry red, a metal with a high elastic limit and great toughness at the same time would be produced.

The preservation of the outside and inside of an all steel floating dock, or of one with steel side walls only, is a matter of importance, and with a commercial dock, a question of economy as well. The government, in this country, at least, has had the most experience in this matter. With the New Orleans dock in fresh water, and the Pensacola dock in salt water, the Cunningham coal tar paint has been found to be the most enduring, as well as the least expensive preservative that could be applied to the outside. Red lead has not proved satisfactory on the inside of these docks and the coal tar paint is now being tried. The fumes from this paint are severe on the painters' eyes in a closed space, but this difficulty can be overcome by equipping the painter with a diver's or a fireman's smoke helmet.

Use of Caisson Proposed.

Were it not for the impossibility of preserving and repairing the bottom, there are many who would prefer the solid dock to any self-docking type. In an effort to meet this case, the writer has proposed the use of a caisson. The general proposition is not new and to this class appliances, Lyonel Clark, the English floating dry dock expert, has given the appropriate name of "limpet." The new feature in this caisson is the supplemental chamber, having a circular cross-section. The supplemental chamber gives increased control over the "limpet" in sinking, the buoyancy of the combination can be first destroyed, thereby giving easy handling under water. The most important function of the supplemental chamber, however, is the insuring of a perfect seal against the bottom of the dock before the main chamber is pumped out.

When the revival in American shipping comes, the floating dry dock will immediately take a place of prominence.

MR. DONNELLY:—I might add one word in reply, and in relation to the teredo and the caisson dry dock. Of course, you know that that dry dock was exposed to light. Of course, you will understand that if dry docks are entirely closed and there is no light admitted, it is somewhat different; and I have been very careful to see whether there was any attack by those insects on those docks, and I have been unable to find them where they have been practically sealed up and no light get through, and I think it is safe to say that in a closed structure, where no light is admitted, no such life as the teredo will exist.

The Floating Dock at Ecorse.

H. PENTON (communicated): — With regard to the question of maintenance of all iron or steel floating docks, I might say that when the floating dock of the Great Lakes Engineering Works, Detroit, referred to on page 4, was under consideration, the writer being at that time identified with that concern, the question of type and material was long and earnestly debated, the more so because we had less concern as to corrosion and maintenance than obtains in coast practice. In reaching a conclusion, the longevity of the U. S. S. Wolverine, referred to in the Transactions for 1909, had a prominent part.

We also had before us the case of an iron floating dock in Spain, dating from, I believe, 1858 and still in apparent good condition, though not of the self-docking type. The question, therefore, resolved itself into one of almost negligible maintenance as to steel on the one hand as contrasted with comparatively short life and continually advancing prices of wood, as used in dock construction, on the other. The question of excavation was largely eliminated because of the side launching method prevailing on the lakes, and with which the members are familiar, enabling the use of the same slip for both dry dock and launching berths. In fact, it is a common practice to launch even the largest ships, up to 600 ft. in length and 60-ft. beam, sidewise into the ordinary basin dock having a top width of about 100 ft.

At that time, 1902, there were on the lakes only four ships of 500 ft. in length and the tendency seemed to be towards a somewhat shorter ship and we, therefore, decided that a length of 450 ft. was all that we were warranted in providing for, and we accordingly fixed upon the sectional self-docking type consisting of three sections, approximately 150 ft. in length each, to which a fourth section was added later. In fact, before the three sections as originally planned were built, we ourselves were building ships of considerably over 500 ft. length.

Still later, to provide extra flexibility, two other shorter sections were built. The Ecorse dock is, therefore, so far as my information goes, the largest floating dock in the world in respect of linear dimensions, though not as to lifting capacity. The latter is not an important requirement in mercantile work because underwriters' restrictions prohibit docking a loaded vessel, except at owner's risk. So far as relative endurance of wood and steel is concerned, at least in fresh water, the life of a steel or iron dock is entirely unknown, while that of a wooden basin or floating dock is fairly well established.

HORACE H. THAYER JR.:—Mr. Donnelly has asked for information upon composite docks. I do not know any detailed information except on one dock that I designed for the government of Venezuela about five years ago; that cost fifty-five dollars per ton of lifting power, but it would not have cost as much as that if it had been erected in the United States.

William W. Bates' paper on the subject of "Our Constitutional Shipping Policy and the Compact for Its Establishment" was then read by title, after which adjournment was taken for the day.

The Second Day's Sessions

The Program Includes a Number of Papers of Great Interest and Importance

FRIDAY'S morning session convened at 10:30 o'clock, being delayed somewhat by a meeting of the council. President Taylor occupied the chair. The first paper read was entitled "An Analysis of Tests of Watertight Bulkheads with Practical Rules and Tables for Their Construction," by Prof. William Hovgaard. This paper is a continuation of last year's paper on the "Strength of Watertight Bulkheads." While that paper was of a purely theoretical nature, the present paper contains an analysis of bulkhead tests followed by practical rules and tables based on this analysis. All the tests, except two, were carried out in American battleships and cruisers.

Discussion on Prof. Hovgaard's Paper.

PROF. CECIL H. PEABODY:—I have some brief remarks to make, and I was rather hoping that some other members of the society would discuss the work of my colleague. I would like to say some complimentary things that perhaps I could say more agreeably if he were not my colleague, but perhaps you will accept those as having been said in congratulation of the importance and value of the work that has been done.

I want to speak on one item, on page 9, and make a remark and ask a question in regard to it; it is near the middle of the page, where Prof. Hovgaard says: "In practically all cases the observed curve of deflection of double stiffeners, tests Nos. 1 to 6, corresponded fairly with the curve calculated under the assumption that the stiffeners were freely supported at the apices of the brackets, and this in spite of the fact that the brackets fitted both at the top and the bottom of the stiffeners, were very substantial." I wish to ask whether, in Prof. Hovgaard's opinion, it is the difficulty of piecing members to the end, or whether it may be due to the fact that stiffeners are put on both sides of the plates, the connection to the neutral axis is not properly sustained, and there may be longitudinal sloping, this may produce the same result as the lack of stiffeners at the end.

There is another item I would like to speak of—not in the light of criticism—but as to the undesirability of using the word "stiffeners" at all, because that looks as if a bulkhead ought to exclude water, but is not quite up to its business. Now, Prof. Hovgaard has shown very completely that the bulkhead is not to be considered in that way at all, but in a certain sense, the stiffeners and the bulkhead are built to exclude water, and if you use the word "stiffeners," which is the old term, it might lead to some of the disastrous results we have had in the past. I know that to change a name that has been in common use may be impossible, or at all events undesirable, but one is led to surmise sometimes that danger and the loss of life has been the result of the use of wrong words, and the fact of the wrong word having been used, there is a wrong remedy applied, and then there may come disaster. Perhaps I am overestimating the importance of this.

Coaling Warships.

Spencer Miller then read his paper, "Coaling Warships—Notes of Progress." Before proceeding to read the paper, he said:

It would be quite natural for a paper covering the subject "Coaling Warships," to have something to say on the subject of coaling warships in a sea-way, but I have not touched on that view of the question in this paper. In point of fact, if I did touch upon it, I would have to acknowledge that the European navies had far outstripped us on that question; but although the apparatus that solved the problem of coaling at sea was primarily American, today the foreigners have found a machine that has already transferred in a heavy sea 66 tons per hour for a period of eight hours; and that is the record for ships in a sea-way. In the subject matter of my paper, which is the matter of discharging coal from colliers in a smooth sea or in the harbor, we are distinctly in advance of Europe, although whether or not we can hold this position is another matter.

Mr. Miller's paper was devoted to a description of the coal handling gear on the naval colliers Vestal, Prometheus, Mars, Vulcan, Hector, Neptune and Cyclops. All of these colliers, excepting the Cyclops, carry a novel form of coal discharging gear, known as the marine transfer. The Cyclops discharges its coal by self-filling buckets, but with a different system of rope leads. These colliers have been thoroughly described in THE MARINE REVIEW (September and November, 1909). A. L. White said that he had been present at the discharge

of the Cyclops, reporting that one of the buckets discharged four tons a minute and that each of the buckets in 12 hours discharged something like 2,800 tons.

The Gyroscope for Marine Purposes.

Elmer A. Sperry's paper on "The Gyroscope for Marine Purposes" was then taken up. This paper was novel and of great interest, and will be published in full in the Ship Building Edition of THE MARINE REVIEW, which comes out in January. Before reading his paper, Mr. Sperry said:

This subject of the application of the gyroscope to marine purposes has been a subject that has interested me for some fifteen years, and last year, while abroad, I made it a point to see every one who could be found conveniently, who had written on the subject of the gyroscope or who had touched upon its application in any way; and I assure you I met a very interesting group of men, the master of whom is our good friend, Dr. Schlick. Although our rules would not allow me to publish his portrait, which was given to me by Sir William H. White, still I have a slide in which we will see his genial face, before we are through. I found quite a number of people in Germany, who were interested in the gyroscope, but usually in a very theoretical way. Few seemed to have any idea of its practicability, outside of Dr. Schlick, and possibly Brennan in England, and one or two others. Our own Leavitt, in this country, has perhaps made the greatest success with the gyroscope. Sir William White gave me some very interesting records that he had in reference to bilge keels, with which the last paragraph on the first page of the paper deals, to some extent.

I might say one word as to how Dr. Schlick happened to approach this subject. He had, for a number of years, noticed a peculiar action of side-wheel steamers. As a side-wheel steamer rolls, her nose goes round in the direction in which the roll takes place. He thought about that a great deal and of what utilization could be made of it, and it led to his work of installing his sea bar, which we will see in the views. When he read his paper in Manchester, quite a number of Englishmen jumped up and said there was no such thing as he said he had seen, that the nose of a side-wheel steamer turned in the direction in which her roll took place, and that every ship rolled; and the testimony was so strong against Dr. Schlick that he could only get up and say: "Well, I saw it;" and he did see it, and the motion he observed was absolutely different from that motion known as yawing. When a ship yaws, it goes in an opposite direction, but when it has this gyroscopic motion, it goes off in the same direction.

After reading his paper, Mr. Sperry illustrated it with a number of stereopticon views and further exhibited its powers by means of a model gyroscope, which attracted great interest, the chairman speaking of its control of motion as something uncanny almost. Adjournment was then taken for luncheon.

Comparative Results in Steam and Coal Consumption on Yacht Vanadis

UPON convening on Friday afternoon, Clinton H. Crane's paper on the subject "Comparative Results in Steam and Coal Consumption with Turbines, Reciprocating Engines and a Combination of the Two on the Steam Yacht Vanadis," was read by the author. This yacht, designed by Mr. Crane, was built on the Clyde, in 1908. The propelling machinery consisted of the usual arrangement of Parsons turbines with a high-pressure center and two low pressures driving the wing screws. The guaranteed speed of the vessel was 15½ knots maximum, with a cruising speed of 13 knots, which was to be obtained on a guaranteed consumption of 26 tons of coal per 24 hours. On trial before delivery, this guaranteed speed was exceeded by about one knot, and a twelve-hour coal test was run at 13 knots when 13½ tons were supposed to have been burned. Special stress was laid on the question of economy at cruising speeds and the turbines were designed primarily with this end in view. The owner reported, however, that the yacht was consuming more coal than the guaranteed amount, so much so as to make her cruising radius inconveniently short. A series of tests were, therefore, decided upon, and the best test showed a consumption of 33 tons, or 27 per cent more than the guarantee. It was decided to remove the center high-pressure turbine and replace by a reciprocating engine, exhausting into the two low pressure turbines. Under the new arrangement, the yacht consumes 23.47 tons of coal per 24 hours. The summary of coal and water tests is incorporated herewith.

Discussion on Mr. Crane's Paper.

H. B. ANDERSON:—The author states that special stress was laid on the question of economy on cruising speed, and on a twelve-hour run at 13 knots, 13½ tons was supposed to be burned. Such a statement is a little contradictory, and I should like Mr. Crane to let us know exactly what was the method used to determine the quantity of coal burned, and by whom it was weighed and measured. After the boat had been in commission a few months, we were requested to make an inspection, as it was reported that the ship was burning a very great quantity of coal, far more than the guarantees, and I was on board at three of the tests, on the last of

Summary Coal and Water Tests.

Type machinery.	Date.	Mean draught.	Displacement, tons	R. P. M.	Speed.	Coal, tons per 24 hours.	Water, pounds per hour, propelling machinery only.	Water, pounds per hour, all purposes.	Water, pounds per hour, propelling machinery only, reduced to 13 knots.	Water, lbs. per hour, all purposes, reduced to 13 knots.	Coal, tons, reduced to 13 knots.	I. H. P. for 13 knots.
Three turbines.....	Oct. 5-6, 1908.....	12 ft. 9 in.	1,506	451.3	12.968	33.92	.....	.....	.....	.....	34.0	.....
Three turbines.....	Oct. 14-15, 1908.....	12 ft. 2 in.	1,416	454.2	13.022	33.00	23,962	29,188	23,700	28,926	32.9	.....
Engine only.....	May 20, 1910.....	12 ft. 6 in.	1,467	152.4	12.968	.....	19,000	23,000	19,152	23,152	25.0	1,135
Combination engine and two turbines	July 13, 1910.....	12 ft. 4 in.	1,442	141.2 452.0	13.3	.....	18,400	22,960	17,700	22,260	....	.....
Engine and two turbines...	July 14-15, 1910.....	12 ft. 2½ in.	1,422	140.9 452.5	13.3	23.47	.....	.....	.....	.....	22.7	.....

which we reduced the consumption to about 33 tons for the 24 hours. Now, this amount of coal seems to be excessively high when it is compared with the Clyde trial, but I think it should be borne in mind that the conditions out here are entirely different from those on the Clyde trial. First of all, we were burning ordinary American coal against Welsh, which, of course, is not anything like so good. Then secondly, the 24-hour trial out here is infinitely more severe than a 12-hour trial with Welsh coal. On a 12-hour trial, you would not have to clean out the fires at all, while here we do. Then the builders' men probably knew how to get better results from the boilers than the ordinary stokers did, and we did not interfere with the stokers' arrangement at all, but left that to the men.

Then also I think the whole turbine efficiency could have been very much improved by cutting down the propellers and speeding up the turbines; in other words, making the turbines more economical at 13 knots, because the boat was designed at a guaranteed speed of a little over 15 knots, and on trial it came out at 16. I think I could have effected a saving of about 12 per cent, which would have brought the coal consumption round to about 30 tons for 24 hours.

I think Mr. Crane is to be congratulated on the success of the reciprocating installation, but at the same time that result has been obtained at a sacrifice, which is speed, but at the same time saving in coal consumption and greater cruising results.

I would like you now to turn to the curves, and will just say this; on plate 1, curve 1 shows the speed of the reciprocating engines without any propellers on the wing shafts, and on that trial the boat made a maximum speed of about 14 knots. The curves 2 and 3 show the combination at work at which the best speed was about 13.7. Curve 4 shows the straight turbine; I think that curve should be extended right up to 16 knots, and the other two curves stopped at 13 knots for curve 1 and 13.7 for curve 2. This will show what the turbines did at increased speed, and which it is not possible to get out of the combination.

Our Old Friend, the Indicator.

COL. STEVENS:—May I ask, Mr. Chairman, in view of Mr. Crane's reflection on our old friend, the indicator, how he would act where I have found myself running under very small differences of wind, and where small differences would have effect on each run; what has he to say on the question of whether a mean effective pressure is not derived from the speed of revolution?

THE CHAIRMAN:—Does any other gentleman desire to add to this discussion?

ADMIRAL H. I. CONE:—May I ask that Mr. Crane will throw a little more light on the subject as to whether the ship in these tests was run at all in combination, at a greatly reduced power, with a view to get the effect of the exhaust reciprocating engine at one-tenth of the power.

MR. CRANE:—We never ran at more than ten knots.

ADMIRAL CONE:—I ask this question because these are problems we are up against every day; I mean as to the effect when you reduce the power greatly, as we have to do under peculiar conditions—in other words, what effect the introduction of a small amount of steam into a reciprocating engine would have on the turbine when it got to the turbine?

MR. CRANE:—I think I can answer that when I come to the general answer.

Measuring the Coal.

E. P. PLATT:—I simply wish to refer to the question of the trials on this boat, without any regard to the turbines or the reciprocating engine, but mainly in regard to the boilers and the question of coal consumption. It is evident from what is said in the paragraph here in regard to economy, that in writing this paper and in trials on this side, the whole question was a question of economy in contrast with the speed in knots. Mr. Crane makes out that that was made a great point of, when the boat was being designed. Then when it comes to the question of the trial, which was carried out in Scotland at 13 knots, strangely enough, the test was only conducted for 12 hours and not 24 hours, when 13½ tons were burned. I would ask him in regard to the method adopted in measuring the coal on that trial. It seems to me from what I have seen of boats designed in England, particularly yachts and the trials that have been made there, that it is generally understood and expected that those trial trips will be made, as they are always made, with picked Welsh coal, and that the results obtained then will be practically trial results obtained with good picked coal. Is it not to be expected that with boilers run in that condition a very different result will be obtained than those obtained in this country with ordinary coal such as is sold in New York—not with the ordinary, good steam coal, but with the ordinary stuff bought and put on the wharf for these boats. I think perhaps some of the men here can tell us with regard to some trials that have been made on other boats in which a very considerable difference has taken place between trial tests of the boat run with ordinary coal bought economically over here and with high-class coal.

H. F. BATES:—As a matter of record, I would like to call Mr. Crane's attention to the air pump on the high pressure engine, one air pump in operation at a time. I thought it might be well to mention that.

Mr. Crane's Reply.

CLINTON H. CRANE:—I will answer this discussion, Mr. Chairman. I had hoped that some of the gentlemen who were present at these tests would express some opinion as to the care and accuracy with which they were performed. I know there are some others present who were also present at the tests.

The question which Mr. Anderson has brought up is a question which I do not feel very much like replying to in this society. It trenches a little more closely on the sort of disagreeable discussion which we had last year. I presented this paper as a comparative set of trials of the machinery of the vessel in three different conditions. The tests were carried on as nearly as possible in the same way.

In regard to the question of bad coal, our evaporation per pound of coal works out a little better than 9½ lbs. Now, members of this society may have had much better results with steam coal, even with picked steam coal; I for one have not. I find more tests where the evaporation runs at 8 lbs. than I do at 9½ lbs. To show in different runs what the difference in coal would mean would be assuming that our boilers gave us nearly 12 lbs. steam per pound of coal, not from and at, but actually from a pound of combustible irrespective of ashes, and I do not think it is fair to expect such a result. So far as the speed is concerned, there is no question that in making this speed we made a sacrifice of from 1½ to 2 knots of our maximum speed. Whether this could have been avoided is not the question. I think anyone who will look at the sizes of the propellers, the relative pitches, will see that it was perfectly impossible to run at a very much higher speed without overspeeding our center engine, and still have it running correctly for our 13 knots. We made a trial of allowing live steam to go directly into our low-pressure turbines, and got very close to 15 knots, but it was not a feasible working arrangement excepting for a stunt.

Tests at Reduced Speed.

So far as economy on very much reduced speed is concerned, I have a record of comparative tests at 10 and at 13 knots. These were run last winter, when the boat was finished, not with the present propellers, but the two tests

run in the same condition. If it would be of interest and would not cumber the transactions too much, I will be very glad to include the data of those tests. Apparently, the turbines are doing less and less work as you reduce the pressure on the center engine. You can notice that if you will look at the slip curve on plate 1. You will notice that at 10 knots the turbines are showing 10 per cent. If, however, you will look at the speed revolution curves 1 and 2, just above, No. 1 being for the boat driven by the center engine only, No. 2 the revolutions of the center engine when working in combination, you will see that even at these reduced slips the turbines are still helping, and if they did no more than turn around without resistance, they still would be of advantage at the regular cruising speed. In this 10-knot condition, there was about 10½ to 11 in. vacuum in the turbine receiver.

In regard to what Mr. Stephens said about the indicator card, the procedure was to take three sets of cards on each run, to figure the cards on the basis of the mean revolutions of the run, plot the individual spots and carry the curve through those spots. Undoubtedly, in the lower speed runs, the low-pressure card is not telling all the truth. I think anyone familiar with indicators will know how difficult it is to touch even lightly on a low-pressure card and not have it interfere with the action of the indicator.

Perhaps it would not be amiss to have me say that our experiences with the vessel in the three conditions has been that in general cruising with adverse weather, our speed fell off very much more with the turbine than it has since we have had a large propeller to help us out.

The comparisons in this regard were all run in summer weather conditions, smooth sea and clean bottom. In actual service the economy in coal is very much greater than is shown by these results.

John F. Metten's paper on the subject "New Propelling Machinery of the S. S. Creole" was, at the author's request, deferred for one year.

Some Suggestions for Reducing the Loss by Fire on Vessels

VICE President McFarland took the chair while Samuel D. McComb's paper on "Some Suggestions for Reducing the Loss by Fire on Vessels" was being read. This paper is an extremely valuable one.

Three Classes of Fire Hazard.

It is abstracted as follows:

From the standpoint of fire hazard, vessels can be divided into three general classes, viz.: Steam, gasoline and those without power. On steam vessels the principal ascertained causes of fire are woodwork around up-take or stack igniting, spontaneous combustion of coal, fire originating in the cargo and from galley stoves, lamps and candles. It is of the utmost importance where a stack passes through a wood deck that the opening be cut at least 12 in. clear all around and the wood be faced with asbestos and sheet iron or steel. If forced draft is used and overheats the up-take and stack further protection is needed—either the up-take and the base of the stack should be covered with cement or all the woodwork within a distance of 3 ft. should be covered with sheet iron over asbestos. When covering a boiler care should be taken along the sides of it; frequently the space betwen the boiler shell and bunkers is so small that it is difficult to make a good job, but in no case should this space be packed up with non-conducting material. Some opening should always be left between the covering and the bunkers. On a leg boiler the covering on the sides of the fire-box should be carried right down to the floor. A coaming should be placed at the front of boilers extending across the fire-room to prevent hot ashes getting between boiler and bunker sides. The same case that is used in protecting woodwork around the boilers should be used around the galley stove and stove pipes. Most important of all it is to have a metal hood over the stove or have the ceiling overhead covered with asbestos. In engine rooms the method of carrying lubricating oils and waste needs attention. It is well to have the supply of oil as small as possible. All oil cans should be carried in metal trays to catch the drip and all wooden shelves on which oil is kept should be completely covered with metal, having the edge turned up and all joints soldered. No oil should be kept in partially filled barrels; when a barrel is opened it should be emptied at once. Metal receptacles with rolled joints should be provided for carrying waste.

Frequent Source of Fire.

Lamps have been a fruitful source of fire on shipboard. Glass lamps frequently break or crack and should never be used. All lamps should have metal bodies and should be securely fastened in their sockets. They should be carried in substantial wall brackets or suspended from the ceiling and be well stayed to prevent swaying. The use of common table lamps, which are easily upset, should be prohibited. If electric lights are used, all wires in the hold, engine and boiler spaces, where cargo is carried on main deck and out of doors, should be in iron conduits. Switchboards should be of slate or other non-inflammable material and well clear of the woodwork back of them. The use of torches in the engine and boiler rooms probably cannot be prevented, but they should be carefully used and not left about when lighted.

The most hazardous type of steam vessel from the fire standpoint is the wooden tug boat. The boiler is usually the largest size that can be installed and is usually just as close to the woodwork as the law permits. To make matters worse, on the average tug there is a platform or grating over the boiler where wet lines are placed to dry out. Inside of the house over the boiler where the ventilation is poor the heat becomes excessive and the woodwork around the stack is ignited or the bunker sides will catch fire. A large percentage of the tug boat fires originate in this way and all could be prevented if good air space was left around the boiler and proper ventilation provided over it to allow the hot air to escape.

Freight Steamers Hazardous.

Freight steamers are also a hazardous class. It is impossible to lay down any set rules for extinguishing a cargo fire, for both the cargoes and the vessels carrying them are so varied. Every compartment, however, should be fitted with a pipe running to the pilot house and air should be drawn from these pipes continuously. A fire starting in the hold could be promptly detected from the smoke issuing from the pipe which would also show exactly in which compartment the fire was located. In addition, each compartment should be fitted with a steam fire extinguisher so that steam could be turned on

immediately when the fire was discovered. Every vessel carrying cargo on the main deck should have sprinklers.

The author also directed attention to the fact that there is one type of vessel on which there is no government inspection and on which fire losses have been numerous and heavy, namely dredges, pile drivers, floating derricks and drills. As a general rule these plants are lacking in fire fighting equipment.

All vessels should be so equipped with fire extinguishers that every part of them can be reached promptly and effectively by fire fighting appliances. Every second counts in fighting fire. The time lost in coupling up a hose which should have been connected may cause the loss of the ship. Approved fire extinguishers should be carried in every pilot house and in every galley. When a fire attains a size which is beyond the control of an extinguisher it becomes necessary to use hose. All steam vessels should have a steam pump and a hand pump and these should be connected to the same main, the hand pump for use in case steam is not up. In no case, even on the smallest boats, should there be less than two lengths of hose. Passenger steamers should all be thoroughly sprinkled, those having sleeping accommodations having a sprinkler in every stateroom.

Gasoline a Great Hazard.

Gasoline is of course the great hazard on gasoline boats. The tank and the engine should both be in watertight compartments, even though the bulkheads at each end of the engine only come up to the floor boards—and the feed pipe should be run outside the hull. All cabin boats should have ventilators to carry off the vapor. The problem of extinguishing fires on motor boats is a difficult one, as entire dependence has to be placed on extinguishers. A series of tests recently held demonstrated the fact that 64 sq. ft. of burning gasoline is too large an area for an extinguisher to handle.

On boats without power, where there is a donkey boiler, a steam fire pump should be fitted and a hand pump connected to hose on each end of the boat should always be installed. There should also be a liberal supply of buckets with draw lines attached. All vessels or groups of vessels should be in charge of a watchman both day and night to keep off thieves and tramps who have caused so many fires. Whenever possible the boats should be laid up under city fire protection. On large and valuable vessels steam should be kept on the donkey boiler when the boat is out of commission, permitting the hose and sprinkler system to be in constant readiness for use.

Discussion on Mr. McComb's Paper.

THE CHAIRMAN:—Gentlemen, you have all heard Mr. McComb's paper, which is certainly most interesting. I presume the precautions which he suggests as necessary to prevent fire will meet with pretty general acceptance as a desirable thing, but as in many other things, the things desirable from one standpoint are not necessarily desirable from other standpoints. I am sure that it is the wish of the author that the paper should receive very thorough discussion. I may say that the secretary sent a communication to Mr. Croker, chief of the fire department of New York City, inviting him or some of his representatives to be present here at the reading of this paper, and also to some of the officers of the supervisors or inspectors of the steamboat inspection service. I believe a representative of the fire department of New York City is here, and we will be very glad to hear from that gentleman, if he cares to say anything.

Discussion by Chief Kenyon.

CHIEF KENYON:—In listening to the reading of that paper, I don't think it interested you gentlemen very much. I want to say that the author made many excellent points, and he has shown a fund of knowledge of the duties of a fire chief. As to the classification of these different vessels he talks about, the different old schools and other suggestions and all that, I don't think it would matter much if they were all burnt up. There is one paragraph I am going to read: "It is the opinion of many that the laws relating to the steamboat inspection service should be amended. They should require that all vessels should be constructed, equipped, manned and operated in a manner that will thoroughly safeguard human life, and should be so worded, codified and classified that any one with ordinary intelligence referring to them could find what they are looking for and understand it."

The modern tendency, the tendency of today, is to get all the luxury that is possible, not alone in hotels and buildings, but in the modern steamship. Every device and every possible means is employed to cater to the fancies and the luxury of the traveling public. Now, I want to ask you gentlemen of this society if you have kept pace with the architects that are building these sky-scrapers, in protecting human life in steamships that are plying between here and Europe and other parts of the world. What have you done towards installing apparatus and equipment for these men who are going to sea, these ships carrying 2,000 and 2,500 people aboard, in a ship loaded with cotton, loaded with lumber and loaded with resin? These are combinations that are coming to this port every day. Do you mean to say you can tell me of the installations you have made or any you have worked at? You never gave this a thought. (Laughter.)

I have been called upon to extinguish fires every week on steamers plying between southern ports and European ports, where the only means they have of dealing with fires—and very dangerous fires, too—is the old steam jet, and I see this genetleman, who prepared this paper, says it is a very excellent means of extinguishing fires. Well, I differ from him; it is no means at all of extinguishing fires. (Laughter.)

Suggests System of Piping.

I would make a suggestion—it occurred to me while sitting back there and looking over that paper—that a system of piping could be installed from abaft the hatch combing leading to every compartment, that would be connected with a perforated pipe or sprinkler system, so that when you unscrewed the cap, you would not only have a means of locating that fire, but a means of extinguishing it. I have in mind an experience of a steamer that left this port two years ago with 2,200 people aboard, and she caught fire on the way to Europe, and after pouring steam into that compartment for three days, the temperature got so high that the plates were all buckling, and the captain fortunately thought of drilling holes and forcing five or six cylinders of carbonic acid gas into that compartment, so that she finally reached the other side, and when they took off the hatches, the flames leaped 75 ft. in the air. Now, I am not an alarmist, and I don't come here to frighten a lot of old ladies—

THE CHAIRMAN:—We have a great many military members, you know, who are not afraid of anything.

CHIEF KENYON:—They would be afraid of a big fire, all right. (Laughter.) I say the system of protecting from fire on board ship has not kept pace with other things. The inspectors go aboard ship and make a test with a pump; and when they start it up, it is like a double-barrel shotgun, you could not hold the hose in your hand two minutes. There is no proper cushion on the pump. Then they base a rule on the tonnage of the ship. I fail to see what the tonnage

on a ship has to do with the loss by fires.

I merely wanted to make these suggestions to get you men thinking. It did not appear to me you were doing a whole lot of thinking over that paper; but there are some very good suggestions in it at that. (Laughter.) I don't know that I care to go any further, but if you appoint that committee, they can have any points of information I have got. I am much obliged to you, gentlemen, for your attention. (Applause and laughter.)

THE CHAIRMAN:—Gentlemen, you have shown so thoroughly by your applause that you have appreciated Chief Kenyon's remarks, that it is almost unnecessary for me to say that we thank him for his comments. Is there any one here from the supervising inspector's department? Can we hear from our own members? Surely, there is some one interested in the question of ships burning up. Mr. Stephens, have you anything to say on the matter of the yacht side of it?

W. P. STEPHENS:—I have not anything to say about it. It is a pretty big subject.

CHIEF KENYON:—It may not be out of order for me to say this, that in a motor boat the gasoline is liable to get all over the boat, and if it takes fire, there is just one thing for a man to do, and that is to get overboard as quick as he can. (Laughter.)

Loss of Life is Infinitesimal.

JOHN REID:—Gentlemen, from a shipbuilder's point of view, we have a challenge thrown before us by the gentleman who has just spoken, and while I cannot reply to him today, he has made one or two allegations. He asks what have we done to protect ships against fire? He also states that we have not paid the slightest attention to it. That is a very grave mistake he is laboring under. A great deal of attention has been paid to it. The results speak for themselves. Where is the loss of life in these liners? It is infinitesimal. And as to appliances, he says nothing has been done. He forgets one very important thing on the question of fire extinguishment, and I only mention one, where they used a carbonic acid extinguisher, and it put out a fire at once; and there are others that limit the supply of air and oxygen; and certainly, as a shipbuilder and a naval officer, I say we have done wonders on these modern liners, quite apart from the luxuries on board, to protect them. Where do you find this great loss of life on board ships, considering the number of people passing to and from this country? I will say this, that you lose more people from a fire in New York in a month than you do on these liners in a year.

Discussion by Mr. W. I. Babcock.

W. I. BABCOCK:—Mr. Chairman, I will say there are several passenger boats in service fitted with automatic sprinklers. I will say further that I think Mr. Reid has made a very good reply to Chief Kenyon's accusation. The chief is a good fireman, but he is not a naval architect, and when it comes to making a vessel fireproof, it is also very difficult to make a skyscraper fireproof. It is, of course, very easy to make a building so that a fire should be confined to one or two or three rooms, but you cannot manage a ship in that way. We had, two or three years ago, two papers, describing boats that were absolutely fireproof, one of them a side-wheel excursion steamer, and the other, I think, was a Pennsylvania ferry boat, to be used at Philadelphia; but when it comes to making fireproof construction all over a big ship, and especially for steamers that carry more people in proportion to their size than any others—for instance, the big Sound steamers—the naval architect in designing a ship of that kind has to consider a great many questions besides the possibility of the ship getting on fire; the question of weight, of the steel that is necessary, the question of sub-division, dividing the boat into compartments, all those things have to be taken into account; and we have to remember that it has to be built primarily to make money, otherwise there is no excuse for its existence. It all comes down to a question of dollars and cents. If you put all this construction into a Sound steamer, that you have in a skyscraper, you would have a boat that could not run and make money, because it could not carry passengers enough even if she would float at all, and in addition, the passengers would prefer a boat that would make speed, rather than a boat which, on account of construction, would be safer. Furthermore, it would be not only a much more expensive job to build, but a much more expensive ship to run, and if a boat of that kind was built, she would be immediately in competition with the older boats.

Water Transportation Safer Than Any Other.

Mr. Reid's point of the proportion of the loss of life to the passengers carried on board these ships is a very good one. I cannot quote statistics offhand, but I can say that passengers carried by water transportation are safer than by any other kind of transportation; they are safer than they are on the railroad; safer than in walking the streets of New York, so it is not fair to say that the architects of this society and of the country have paid no attention to the development of devices for saving life on ships. I do not say that for the purpose of criticising the chief in any way, who is entitled to his own viewpoint on the matter, but I simply state it as a fact.

PRESIDENT TAYLOR:—Gentlemen, I would like first to ask the author of the paper what are the four steamers that were nearly totally destroyed in the vicinity of New York in the last year. Can Mr. McComb tell me that?

MR. MCCOMB:—The steamer Manhattan.

PRESIDENT TAYLOR:—She was destroyed in Portland.

MR. MCCOMB:—And the Redfield, and the New York, and the Poughkeepsie.

PRESIDENT TAYLOR:—The Redfield was built when I was an apprentice, in 1864. The other was built a year or two before that. What was the other one?

MR. MCCOMB:—I think the New York.

Discussion by President Taylor.

PRESIDENT TAYLOR:—Now, this only goes to show you, gentlemen, what I have said on this floor before, that steamers in actual service are not burnt up very frequently. A very unfortunate accident happened here in the East river a few years ago that is still brought to your minds or the minds of the public very unnecessarily; that steamer was taken out, after being laid off all winter, with a crew that was picked up off the wharf at that time, and she carried a number of women and children and most of them lost their lives. It was a very deplorable accident, but it was very exceptional. My knowledge of steamers that have been burned, and which now goes back many years, tells me that they usually occur where steamers have been laid up for the season and then taken out without proper overhauling. Mr. McComb has named the Manhattan. She was lying at Portland, waiting for transfer to go to the Pacific coast; and the Redfield in the same way. They had no passengers on board, to the best of my knowledge and belief. All the large steamers that have been burned were burned while they were laid up. The New York was lying at Newburgh, and if the crew had not been so careless, the boat would never have burned. The Bristol, at Newport, was burned with only a watchman aboard, and the record shows he had punched the watchman's clock, and he must have punched the clock. Another steamer was burned at Portland or one of the ports of Maine, belonging to one of the eastern lines.

I said, several year ago, on this floor

that if I believed that one of the Fall River Line steamers could possibly be burned, as the Bristol was burned, as the New York was burned, in actual service, I would never draw another plan or have anything to do with the construction of a ship, any more than I would commit suicide. I believe it is impossible—not impossible, but it is improbable—that a fire, such as that of the Slocum, could take place on a well-regulated line, carrying passengers, in the vicinity of New York.

No One Man Knows Everything.

Now, I admire the chief's confidence in himself and his knowledge, but his statements only go to show that there are really none of us that know everything. I know nothing about putting out a fire, compared with his knowledge of putting out a fire. He knows more about that in one minute than I do in a day or in a month. On the other hand, I am quite certain that the naval architects know more about building vessels in one day than he does in all the time of his existence, and that is no reflection at all on the chief. We follow along the lines of our profession, and do not always perhaps see what is on each side of it. The necessities of the naval architect's profession have broader problems than any others, and no one outside of that profession really understands the difficulties of that particular study.

The later boats that have been constructed, a great many of them, have been supplied with the very things the chief asks for. Mr. Babcock has said that steamers on the lakes have been supplied with automatic sprinklers. I had myself something to do with the rebuilding of the Plymouth and with the Pilgrim, and I put fire sprinklers there; the same with the Peconic. When the New Haven was built, the owners directed that they should not be put on her, for good and sufficient reasons to them.

An Absolutely Fireproof Vessel An Impossibility.

We cannot make it absolutely impossible to burn up a steamer of that description, but it is impossible to make a fireproof steamer, because no fireproof construction you can possibly put on a floating vessel and carry it on your displacement, can restrain the fire that will come from the cargo, if allowed to take place. You can see from time to time in the city of New York—you don't need to go any further for experience with fireproof buildings—I can show you the ruins of one now down at Fourteenth street, where the fireproof construction was absolutely twisted and torn fairly apart; and no steamboat construction could stand the effect of a fire underneath it.

We have taken—I may speak for the concern of which I happen to be vice president—we have just taken another contract, and it is on behalf of the owners that I am now speaking. The contract was made to rebuild certain steamers and make passenger steamers of them. Two or three days after this contract was made, a discussion arose among the committee who had charge of the matter, as to what could be done toward making them safer, and they added a very material sum to the contract for the purpose of trying to make them as far as possible not fireproof, but safe from destruction by fire.

THE CHAIRMAN:—Slow burning?

Problems of the Naval Architect.

PRESIDENT TAYLOR:—Yes, slow burning. Now, think for a moment; take the steamer Commonwealth, she has three or four decks; if we made the structure of each of those decks anything like the structure of this building in which we stand, there is not enough displacement to carry that weight; it is an entirely different construction, and people on shore forget that, and sometimes I think our own people possibly forget. Also, as to steel construction on vessels, we have in this vicinity a steamer, built entirely of steel, the steamer Maryland. In the summer time, they have to put down wooden gratings so people can walk on them, the decks become so hot, and in the winter time the water freezes in the staterooms.

These problems all come to the man who studies the particular business he is in, and, of course, the man whose profession is the putting out of fires—and I want to say I believe New York City is the best supplied city in the world in that connection, but these are practical questions that do not come to such a man, and he does not understand them, and he does not know. The chief shows that right here; he does not know the care and the thought of naval architects in constructing those vessels.

Gentlemen, I have found in all well-regulated lines managers are desirous of fighting the chance of loss of life, and in looking up statistics I find fewer lives have been lost—including even the Slocum disaster, which was most deplorable in every way, and which should never have happened—but even including that, there are fewer lives lost on steamers than on the railroads, and there have been considerably more lives lost in the city of New York, with all its wonderful fire department in the last year than has been lost on steamers in two years. (Applause.)

Kenyon's Life as a Sailor.

CHIEF KENYON:—Gentlemen, I want to say a few words to correct what seems to have been a false impression conveyed to you. Now, I started in to arouse you men, to get you to think (laughter), and I find you are thinking along the lines that I imagine the side of a ship is the side of a house. Now I want you men to understand that I spent 14 years of my life, in the prime of my youth, studying ships, and I am not a landsman, I am a sailor, and a master, too, and I have had several fires at sea and know just what they are. I was one of the crew of the Abyssinia when she burnt in the Irish Sea, and I did not come here with the idea that I was coming up against people from Squeduck or somewhere like that. (Laughter and applause.) The simple proposition I made is this: It is not a question of expense, to my mind, because what I suggested is a mere matter of a few dollars, it don't amount to anything; but expense seems to cut quite a figure with some people. An old ship owner in Liverpool, some years ago, had a few old hulks, and he put on them a few bags of biscuit and things of that kind and sent them to sea; he did not want them to come back, he wanted the insurance, that was all.

Now, it is a very hard thing to locate a fire on a ship. You have a ship with three or four decks in her—you have the lower hold, you have the orlop deck, you have the steerage deck, perhaps those decks are battened down and full of cargo; how are you going to determine what deck, if a fire occured, it is on? I have had some experience in that line, and I find captains of ships coming in here bringing them from London to New York and from New York to London and everywhere else, where they have had a fire and the fire has been extinguished, and it is not extinguished at sea.

A MEMBER:—Did you sink the ship?

Extending Pipes Into The Hold.

CHIEF KENYON:—No. I never sank anything. What I suggested was a manifold of pipes alongside the hatch, with a screw cap to the pipe, and have one leading to the lower hold, one to the orlop and one to the steerage, and by taking that cap off you will determine where that fire is, and once you locate the seat of the fire, it is like locating the seat of a disease, and the rest is easy, and if you put a hose into that you have the fire out in a very short time. There is not much expense in extending that pipe into that hold. I am not a naval architect, but I know

enough about a ship to know that it does not cost very much.

Now, that was simply my suggestion. I say they have no other means today except the steam jet, and I know that where that steam is going into a hot fire, it is of no use whatever for controlling that fire. I have had hundreds of vessels come in here in that condition. I have also seen where they have had the plates of the ship buckled up.

Now, these are all facts which can be easily proved by my records. Take, for instance, the steamer that was mentioned here, the Commonwealth, or the Pilgrim, they are fine ships, like any other ships that are finished in woodwork and varnished, and if any fire broke out on these ships, it would go through her like a race horse. What happens? If anything happens, they make for the nearest dock. The ships I have in mind are particularly ships that were carrying a lot of cotton and lumber.

I am not reflecting on the splendid organization that is keeping watch—and the watch that is kept on a ship I know somethig about, I know what watch is kept on a ship as well as any man in this room; I know it is that continuous attention to detail and the careful watching on those vessels that have prevented many accidents of that kind.

Now, I do not want to take up your time, or want you to think that I am trying to cast any reflections in this matter, I am merely suggesting that water could be pumped with very little expense into any compartment, and it could be flooded either through those sprinkler pipes or a system of perforated pipes, just as easy as a steam jet. I am sorry to have taken up so much of your time and I thank you for your attention. (Applause.)

Constant Watch on Board.

PROFESSOR HOVGAARD:—I just want to call your attention to one fact, in which a ship differs so essentially from a building on shore, and that is, as the chief has just remarked, the constant watch that is always kept on board ship, and the moment there is a fire, the whole ship's company is turned into a fire company, just the same as if a building were on fire here in the city of New York, and the whole of the people in the city were turned into one complete fire department. That accounts for the few serious accidents that we find on board ships in that connection.

WILLIAM L. R. EMMET:—Mr. Chairman, I cannot refrain from saying something on this subject after what the chief has said. I am not a naval architect or a fireman, but I feel very strongly that what Chief Kenyon has said is absolutely right. If you put steam in, it prevents combustion, because it fills the space and excludes the air, but if you go down into the hold of the ship, you want to have something to take out the heat. Every pound of water that goes out will carry so many heat units with it. I have happened to see sprinklers at work in a big space full of combustible material, and that is how it worked; the sprinkler distributes a small amount of water, which is evaporated, and the evaporation of that water absorbs a large amount of energy and the fire goes out locally. I think what the chief says about putting pipes into the hold of the ship or putting a sprinkler there, is right—you would not have to fill the hold full of water; the sprinkler is released somewhere below the boiling point; if you send the water there, the water will be released, and then steam will be generated, and the steam will carry away the heat units, and the cargo instead of being all wasted and the plates buckled, will be all right, and the fire will subside and go out. I am inclined to think the chief is absolutely right in what he has said.

Fires on Lake Steamers.

H. PENTON (communicated): — In Plate No. 3, Mr. McComb shows a view of what he calls a modern steel fireproof steamer, and in Plate No. 4 a view of the same ship after a fire. Both of these views are of the steamer City of Cleveland, which burned at the fitting-out dock at Detroit during construction and with her fire-fighting equipment consequently inoperative, and even incomplete, and with no crew whatever on board.

If my memory serves me, the fire was discovered early in the morning, some hours before the workmen had begun work, thus bearing out what President Taylor has said in regard to ships burning alongside the dock. Mr. McComb further, I think, does an injustice to Vice President Frank E. Kirby, the designer of the ship, as well as her builders, since I do not think either have ever made any claim that the City of Cleveland was "fireproof."

As regards the steamboat inspection rules, I may say that ship builders and the technical press for years have been complaining of their absurdity. Perhaps in the fulness of time, something may be done towards their betterment.

As regards sprinklers, I very much doubt their value aboard ship, especially those of the day or excursion type. I do not believe that a sprinkler is at all likely to go into operation on such a boat; I believe it highly improbable that the necessary temperature point will be reached before the fire has gone beyond control, because of the open decks, and yet that is the very type of ship above all others which is most in need of fire protection, so far as life is concerned. Mr. Reid and Mr. Babcock are both beyond question correct in their statement as to the very small proportion of loss of life among travelers by water. The records of the Department of Commerce and Labor will show that the loss of life from all causes among steamboat passengers is a very small percentage indeed, merely fractional as compared with the percentage lost among travelers by rail, and the loss by fire is infinitesimal.

Mr. McComb is very much in error in his statement regarding three boats having been burned within the last month in the open lake. The three steamers he mentions, the Wasaga, the Lycoming and the New York, were all three what are known as package freighters, of the older wooden type. The Wasaga, formerly the Wissahickon, was built in 1876 and was burned at a dock in Copper Harbor, Lake Superior; the Lycoming was built in 1880 and was burned alongside the dock at Rondeau, Lake Erie; and of the three the only boat burned under way was the New York, on Lake Huron, and which was built in 1879, and at the time the fire broke out, her crew were to the last man engaged in a struggle to save a foundering ship, and even had she been provided with the most approved equipment, and to Mr. McComb's entire satisfaction, the question of the choice which would have been made by her crew as between burning or foundering, is one each member may decide for himself.

THE CHAIRMAN:—Does any other member wish to comment on the paper? If not, the author will be given a chance to reply to any of the remarks.

Mr. McComb's Reply.

MR. MCCOMB:—In regard to sprinkler systems generally on passenger steamers, while the Goodrich line running out of Chicago, and the Sound steamers out of New York, are equipped with sprinklers, most of them are not. The saving in insurance alone on those boats would more than equal the cost of installing sprinklers, and the vessel owners would be in money at the end of the year by installing sprinklers.

The types of vessels are so radically different that different methods of fire extinguishing apparatus have to be put on them. On boats like the Old Dominion boats and the Mallory line boats going south, the principal danger there is a cargo fire in the hold, and as Chief Kenyon suggests, the means of

admitting water to each compartment is a good idea. I suggest running those pipes to each compartment of the hold. The principal danger is not from fire in the hold, it is fire in the cabin.

In regard to what President Taylor says as to boats not being burned up more in commission, I will say that I know of three boats having been burned up in the last month, all in commission. The steamer Wasaga was burned up while on Lake Superior; the steamer Lycoming was burned up on Lake Ontario; and the steamer New York on Lake Michigan, and all three were total losses and were all three actually on voyages in the middle of the different lakes when the fires started.

President Taylor is absolutely right, and Mr. Babcock, too, that on the lines of good ownership, like the Goodrich line and the Sound steamers, every precaution is taken to save life; but those are not the boats that are burning up. It is people who are not making money or hardly any money who are evading the law as much as they can; and the law now ought to be improved. The steamboat inspection laws I do not consider are as good as they could be made, and that is why I suggest to the society that it should appoint a committee to take up the question of the inspection laws so that they may be made to conform to the safety improvements and the necessities of the present day; and if a man wants, now-a-days, he can have his boat very well equipped with safety appliances, and I would like to urge on the society to appoint such committee, which, I think, would result in a great deal of good.

The program of papers was concluded with the reading of Charles B. Page's paper on "Two Marine Installations of Producer Gas."

The Banquet at the Waldorf-Astoria.

Ringing words of admonition to the American people to awake to their neglected opportunities of strengthening their commercial relation with the South American countries and to an appreciation of the fact that foreign shipping interests are doing all in their power to prevent the upbuilding of the American shipping industry were sounded by Hon. C. H. Sherrill, United States minister to the Argentine Republic, at the annual banquet of the society held at the Waldorf-Astoria, Friday evening, Nov. 18. "It is time that the people of the United States awoke to their folly of not believing that foreign shipping lines are trying to restrain the helping of the shipping business in this country. Why should not we protect our shipping when we protect our other lines of industry? When anyone says that the American ships plying between Buenos Ayres and New York are adequate for the trade at present, either he is interested in foreign shipping or in the unpatriotic pursuit of keeping out other Americans from that country who might interfere with his business. If we give only the same protection to our shipping interests as we do to the other leading industries, etc., it will not be very long until the American flag will be back on the seas in the way that won for us the war of 1812."

Wonderful Advance of Argentina.

Mr. Sherrill spoke of the wonderful advances that have been made by Argentine Republic, both in population and in the general development of national life. He spoke of the stupendous resources of the country, much of which dealt with the great fertility and productiveness of the soil, and told of the effective service which the diplomatic corps of this country was doing to encourage the increase of trade from these countries with American merchants and manufacturers and which is in line with the general policy of President Taft and Secretary Knox. He stated that in the case of Argentine Republic the yearly trade with this country had been increased by such methods from $47,000,000 to $80,000,000.

Admiral Garcia, of the Argentina navy, who is now in the United States watching the construction of two battleships for his country, gave an outside impression of the facts outlined in Mr. Sherrill's address. Admiral Garcia said that a few years ago the American flag could be seen flying from many merchant ships in the harbor of Buenos Ayres, but that it is seldom to be seen now among the many ships that enter that port.

Commander L. S. Van Duzer, of the United States navy, declared that it seemed to him that it was time that the people of the United States awoke and built a few ships and that he hoped to see before many years a merchant marine worthy of our present great navy.

Loving Cup Presented to Admiral Bowles.

An interesting event in the evening's program was the presentation to Admiral F. T. Bowles, past president of the society, of a massive silver loving cup. The presentation was made by Admiral W. L. Capps, formerly chief constructor of the United States navy. Admiral Capps tendered the gift on behalf of the society as a token of esteem and affectionate regard for the retiring president. Admiral Bowles, in responding, thanked the society for its mark of regard conferred upon him and stated that he valued most highly the moment of his arising to express his appreciation to his fellow members for the honor given him. "It is unfortunate that the inadequacy of ship building in the United States causes such close competition in business among us, which, I fear, sometimes may give rise to some hard feeling. Yet here at these meetings we can meet on a social and friendly basis and help each other. Each member can, in some manner, assist in raising our profession before the world." President Stevenson Taylar, of the society, presided as toastmaster of the banquet. Among the others who spoke during the evening, or who occupied seats at the guests' table, were: Secretary-treasurer W. J. Baxter; R. W. Dana, secretary of the Institution of Naval Architects, London, Eng.; Commander Vassilieff, Russian naval attache; Commander Baron F. Von Preuschen, Austrian naval attache; Hon. Chas. E. Littlefield, former member of congress from Maine; Nicholas F. Palmer, president Quintard Iron Works, New York; H. S. K. Williams; Admiral H. I. Cone, engineer-in-chief, United States navy; Lieut. Commander B. d'Azy, French naval attache; Commander H. Retzman, German naval attache; F. A. S. Franklin.

Mr. Dana, as secretary of the Institution of Naval Architects, London, Eng., expressed the hope that the American representatives would appear in large numbers at the congress of naval architects to be held at London next year.

Obituary

Capt. D. P. Craine, one of the oldest masters on the lakes, died at his home in Milwaukee on Nov. 12. He was forced to leave his boat, the William Livingstone, about two months ago.

Capt. John Edwards died at his home in Detroit on Nov. 19, at the age of 73 years. He had sailed passenger boats on the great lakes for over 40 years. His first command was the Arrow, which ran between Detroit and Toledo about 40 years ago. He was master of the steamer City of Erie, of the Cleveland & Buffalo line, when he retired.

Capt. H. T. Archer, of Cleveland, died at St. Mary's hospital, Detroit, on Nov. 26. He had to quit his boat on the last trip at Detroit. Capt. Archer was about 56 years old and had sailed since boyhood.

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Naval Cost Keeping

In the October issue of THE MARINE REVIEW, we gave a complete description of the Meyer system of navy yard cost keeping and showed that the system violated the mandatory provision of the law that all indirect charges should be included in the cost of work. We showed that the so-called naval costs are not in reality costs, but are a mass of figures which mean nothing. We showed that the system permits of extensive juggling of accounts, and that this is taking place.

We did not, however, expect the naval authorities to admit that the cost system was so designed as to permit the accounts to show any results that might be desired. It seems, however, that this is the case.

The Army and Navy Register usually voices the sentiments and views of the naval authorities, particularly of the department in Washington, and always keeps a club handy for those who dare to criticize the naval admintration. In a recent issue of this journal there appears under the title "Cost of Battleship Florida" the following remarkable statement:

> The naval authorities are confronted with the dire prospect that the cost of the battleship Florida, under construction at the navy yard, Brooklyn, may exceed the limit of cost of $6,000,000.* Prompt steps have been taken to prevent any such excess, and the effort will be made to so arrange the remainder of the work to bring the total cost within the prescribed amount. *There are those who believe it is next to impossible to determine what a battleship actually costs, and that in the end, it is largely a question of bookkeeping which may be made to show that a limit of cost has been exceeded or has not been attained.*

The italics are ours. THE MARINE REVIEW in its issue for September, 1909, applied this identical phraseology to department costs for which, among other things, it was and continues to be, roundly abused. Nevertheless it is the truth, and the exact truth regarding not only the Meyer system but the whole department system. The cost of a battleship or anything else is merely a question of bookkeeping, and the records can be made to show that the ship cost five million dollars or seven million dollars, just as suits the purpose of Mr. Meyer and his satellites. The cost "system" has been designed for the purpose of juggling figures. Mr. Meyer, with the aid of this "system," should be able to prove by cost figures that his system of management is a success. No doubt he will try to do so.

It will be interesting to know the steps that have been taken by the naval authorities to prevent the limit of $6,000,000 being exceeded. Have the naval authorities suddenly increased the efficiency of the New York navy yard and thereby reduced the cost of the work? Not by any means; that is not the navy way. The steps that will be taken will be to juggle the cost figures, taking away charges that properly belong to the ship; or leave undone work which is required by the specifications, and after the ship has been commissioned do this work and charge it to one of the annual appropriation bills; or supply furniture, equipment, etc., under a different account, and consider that these items are not included in the limit of cost. It is more than likely that it will be necessary to take *all three* of these steps to keep the cost below six million dollars.

The New York Shipbuilding Co. is building a sister vessel, the Utah. It is unfortunate for that company that it cannot follow the naval methods, and show a very handsome profit for its stockholders. As comparisons of cost between vessels built in navy yards and private ship yards are frequently made (or attempted) it will be interesting for congress to know exactly the steps taken by the naval authorities to reduce the cost of the Florida.

The contract price of the Utah is $3,946,000.* The cost of the Florida according to the *Meyer "cost records"* will be at least $6,000,000, or 50 per cent greater than the cost of a sister vessel built in a private ship yard. The loss to the people of the United States according to naval "cost records," due to the inefficiency of naval administration, *is over $2,000,000 on one ship!*

But this is by no means the real loss. A reference to the October issue of THE MARINE REVIEW will show

*Hull and machinery and exclusive of armor and armament.

*Hull and machinery, exclusive of armor and armament.

the many large expenses that are *not* included in naval costs. In a private establishment these expenses must be charged to the work produced and they are included in the contract price. If these expenses are included in the costs, the actual cost of the Florida to the government will be over $7,000,000, or perhaps nearer $8,000,000! The actual cost in a government navy yard is approximately twice the cost in a private yard, and on each ship of the Florida class the people lose approximately $4,000,000.

The Florida is a ship of the popular "all big gun" class, of 23,000 tons displacement and 20¾ knots speed. Bids were recently invited on another ship of 27,000 tons displacement and 21 knots speed, and, although only one lone bid was received, for reasons referred to elsewhere, even that figure was $5,760,000, or over $200,000 less than the expected cost of the Florida and included, besides an anticipated profit, of course, all those overhead charges from which the naval-built ship is free; interest on investment, salaries, depreciation and maintenance, taxes, insurance, etc. Those familiar with plant operation can easily work the *direct* cost of the proposed new ship back to probably little over $4,000,000.

One by one the navy department's chickens come home to roost.

Nor is this all that can be said on the navy yard "reorganization," which includes the cost keeping. Additional evidence of its gross inefficiency is uncovered by THE MARINE REVIEW each day. Many of these facts cannot be disclosed here, but if congress will undertake an investigation, and will protect witnesses from the wrath of the discredited department officials, the witnesses will be found available.

The navy yard located in Mr. Meyer's home city, is apparently the most inefficient of all. This is not surprising, for this navy yard is, naturally, the one which is most subjected to the Meyer "inflooence."

A few pertinent questions might be asked by an investigating committee which would bring forth interesting and startling information, among which the following are suggested:

Is it a fact that the commandant of the Boston yard receives instructions, which may be euphoniously called suggestions, from certain Boston congressmen, but which are, nevertheless, accepted and carried out?

Is it a fact that a head of department in the Boston yard contemplated changes in methods of doing work which would have resulted in greater economy, and that certain congressmen called on the commandant and pointed out that these changes might influence the elections and that the commandant immediately directed the head of department to discontinue the economical methods,—at least until after election?

Is it a fact that Mr. Meyer or his so-called aides in personal letters to the commandant directed that no changes be made toward more economical methods until after the election?

A careful investigation will show that navy yards have not been removed from politics; it will show that the yards can be, and are, used for the benefit of the machine politicians.

Much information is already available regarding conditions in the Boston yard, and more is accumulating, and startling disclosures, which will be supported by documentary evidence, may be shortly expected.

It is a matter of common knowledge that the commandant is an officer who knows little or nothing about industrial management and who cares less. He has practically turned the management of the industrial department over to his aide, another line officer, who has also had no experience in industrial management.

This officer is one of that loyal (?) assembly of line officers who gathered on the Panther at the League Island navy yard, and passed resolutions severely condemning the Newberry plan of administration, and which published and distributed circulars containing these insurgent declarations. It is interesting to note that these officers were not punished, but on the contrary were rewarded for this act; then compare the treatment that these officers received with the punishment given officers who, in the course of their duty, have given testimony before the house naval committee.

This once insurgent officer, as aide to the commandant, and as virtual head of the industrial department of the navy yard, is now in position to punish those officers who favored the Newberry organization and he does not hesitate to use his authority for this purpose. Let congress call as witnesses the officers on duty at the Boston yard and compel them to testify as to the conditions that exist in that yard.

There is another mutineer on duty in the Boston yard. The assistant to the engineer officer is a line officer, who was a ring-leader in the Panther meeting. Perhaps he suggests to the aide to the commandant some of the acts of the latter. It is at least rumored in the Boston yard that he makes a most efficient tale bearer. No, the Meyer scheme is not given a fair show in the Boston yard; at that yard there exists an administration of petty spite and revenge; but after all, this appears to be the object of the Meyer organization.

Conditions at the New York navy yard appear to be but little better than those at Boston. It will be interesting for the naval committee to inquire how Mr. Meyer's promises made to the committee last year regarding the turbine casings of the Florida have been kept. Did the machinery division finish this work in the promised time, and what was the cost? It will also be well to investigate the *reported* cost of this work.

At the New York yard they have peculiar ideas of the purpose of costs. The accounting office is a little kingdom in itself; it is situated in a building remote from the offices of the manufacturing department. Everything goes into this office, but little of value comes out. The officers of the manufacturing department cannot obtain the daily expenditures on the many jobs; they do not know how the cost of any job stands; they do not even know the men who worked on a job on the previous day; and there is no way in which they can obtain this information. Perhaps they realize at New York that cost figures under the Meyer scheme are of no value, and act accordingly, or what is more probable,

that they are *too valuable to be kept properly.*

The committee could also ask some pertinent questions as to the conditions of the turrets of the battleship fleet when the ships left the yard. THE MARINE REVIEW has learned that the work was unfinished and that the guns could not be fired. Why was this? Is it possible that the inefficiency of the machinery division, presided over by line officers, prevented these small jobs being finished during the long stay of the ships at the yard? Is it possible that the ships were sent from the yard with the work incomplete in order that the gross inefficiency of the yard under Meyer methods could be hidden? If these were the objects, they have not been attained, for the facts are known and can be presented at the proper time. If the committee will search the navy department files, it will perhaps find a letter from the commander-in-chief protesting against the work done at the New York yard.

If the committee will look still further it may find *two* letters from the ordnance officer of the Rhode Island on the same subject, and accompanying one of these letters will be found a report from the commanding officer written in no uncertain terms protesting against the work. It will be interesting to read the replies of the navy department to these letters. It might also be a pertinent question to ask if these protests had any bearing on the detachment of the commanding officer.

Such are the navy yard and the navy under the Meyer reign of terror, and the American people must pay the price. If they do not learn the truth it will not be the fault of THE MARINE REVIEW, even though certain department officials have declared they intend to put a stop to it. This, however, is only another sample of the "four-flushing" which now passes for ability in the navy.

Side-Tracking Admiral Capps

It was announced in Washington on Nov. 18 that Chief Naval Constructor Capps is to visit the Philippines on a mission of great importance to the navy under an order detaching him from duty on the Atlantic coast and directing him to proceed abroad on special temporary duty. The chief constructor is to make a careful examination of the navy yard at Cavite, in Manila harbor, and of the naval stations at Olongapo and Subig bay. The report of Constructor Capps will enable the navy department to fix the amount of the estimate of appropriations which must be submitted to congress this winter.—*News Item.*

It is scarcely to be believed that the senate and house committees and congress will fail to see the motive for this latest bit of vindictiveness on the part of Secretary Meyer and his constellation of "aides." Capps was forced to relinquish his post at the head of the bureau of construction because he dared to have views of his own, and he is now to be sent to Manila, where he will be out of the way while congress is in session. Capps is a dangerous man to have around while naval committees want to know things. He knows more about the navy and naval affairs than any other officer in Washington. He knows all about the workings of the Meyer scheme of navy yard management, designed to make comfortable shore berths for swivel chair sailors. He knows it is a failure, and why, and has the means of proving it. Worse than all, he has what neither Meyer nor his aides have, the confidence of congress; he speaks the truth; a trait far from universal in the department of today.

As to what he will find on the eastern stations and how his report and his standing will be used as a basis for demanding further millions for the clique to spend, there can be little doubt, and the move has some cleverness to it.

He must not be allowed to tell what he knows nor be available to disprove the statements which will be made to congress. This is perhaps one of the lessons in diplomacy Mr. Meyer learned in Russia. If congress takes any action on naval legislation without calling Admiral Capps before it and demanding that he tell what he knows it will commit a serious blunder. There are plenty of others in the service too who would welcome the chance to speak out if they are invited to do so, and not junior officers either, but officers of high rank, who see and deplore the injury that is being done the service. But what is far more serious, the nation is losing confidence in the navy. Even the patriotism of naval officers is in question. Many consider that numbers of naval officers are merely self-seekers, whose principal aim in life is not their country's welfare, but is to bend all their efforts to self-advancement, to efforts to increase their importance, to increase their comforts, to secure shore duties for which they are unfitted; and all of this at the expense of the good of the navy, at the expense of the country which they profess to love and serve.

There is but one remedy—a real investigation on the part of congress, where witnesses will be protected and where they can tell the truth without fear of punishment.

Features of the Naval Architects' Meeting

The recent meeting of the Society of Naval Architects and Marine Engineers was in several respects notable. The list of papers included several of excellence, and the discussion was fuller than usual.

Sir Wm. White's paper, printed in abstract elsewhere, will doubtless draw forth an even more extended written discussion than was brought forth at the meeting and the transactions will be enriched thereby. To be sure, it treats on a subject of which comparatively few are qualified to speak and if there is one fact which Sir William's paper has brought out more clearly than another it is that even the naval experts themselves are all abroad. It emphasizes and drives home the argument which THE MARINE REVIEW has so consistently championed that naval construction is pure guesswork, and that proof of the wisdom of any design is absolutely lacking. Sir William, out of his own ripe experience, abundantly illustrates the ever-changing view of those who are, for the moment, uppermost in the struggle to incorporate their notions in war ship design. In only one thing are they agreed, and that is in the need for millions more

to spend, a claim that lacks proof most of all. It demonstrates more clearly than any words of ours could that the demand for a navy, an army, fortifications, yards and waste, originates with, and is most clamorously supported by those whose trade is war, while all the efforts of those whose business is peaceful and commercial and therefore not spectacular, seemingly avail nothing in support of a merchant shipping.

The outstanding feature of the meeting was Elmer Sperry's paper on the gyroscope. It treats of a subject big with possibilities, and apparently in no sense chimerical. It goes far beyond the mere question of personal comfort to passengers and crew and in the direction of additional safety for the ship. It is much to be regretted that no opportunity was afforded for oral discussion of this paper, which was one of the most valuable ever offered to the society, and it is to be hoped that the transactions, when printed, will be found to contain a liberal communicated discussion. That the paper and the apparatus possessed the greatest interest for everyone present was demonstrated by the way the members crowded about Mr. Sperry and his model. The performance of the latter was well described by President Taylor as "almost uncanny."

The withdrawal of the paper on "The Propelling Machinery of S. S. Creole" was a keen disappointment to probably the greater part of those in attendance, who looked forward with joyous anticipation to a drawn battle between the champions of the turbine and the veteran reciprocating engine.

That the postponement of the paper and the consequent discussion for a year will not result in diminished interest may be taken for granted.

The author of the paper on fire protection aboard ship stirred up a hornet's nest, and the discussion makes most interesting reading. There are many more profitable subjects of discussion than the loss of life by fire aboard ship. As a matter of fact the report of the Steamboat Inspection Service just issued shows the loss of life *from all causes* among both passengers and crews to have been, during the year, 379 for 328,666,000 passengers carried, a ratio of 0.000001 (1-1000 of 1 per cent), and we have not sufficient space to further subdivide this fraction for those lives lost by fire.

Altogether the meeting of 1910 was one to be remembered with satisfaction.

Our Merchant Marine

President Taft in his annual message to congress, just published, comes out with greater directness than any other president before him in urging the rehabilitation of the American merchant marine. He does more than urge the enactment of necessary legislation, but points out the danger of the present situation as well. He directs attention to the fact that unless prompt action is taken the completion of the Panama canal will find the United States the only nation unable to avail itself of it. This is a telling point and the issue is quite pertinent. If something is not done between now and the opening of the canal to stimulate American shipping in the over-sea trade, there will undoubtedly be made an attack upon the coastwise laws by foreign interests. Straws are already beginning to indicate the way the current is flowing.

In an interview in the *Railway and Marine News,* of Seattle, George B. Dodwell, senior member of Dodwell & Co., of London, operating the great Blue Funnel line to Pacific coast ports via Suez, points to this very circumstance. He says there are not sufficient American steamers to handle the business which will develop between the Atlantic and Pacific coasts of the United States when the canal is completed, and as foreign vessels are excluded by the coastwise laws from this trade, high rates will prevail and the transcontinental railways will have no competition. How's that? Here are his very words:

> Preparations must be made and made soon by the American people to take care of the great trade which is bound to follow the opening of the Panama canal. At present there are not sufficient American steamers to handle the business which will develop between the Atlantic and the Pacific coasts, in which trade, as is well known, foreign vessels are not allowed to operate under your coastwise laws. If ample tonnage is not built for this business very high freight rates will prevail and the canal will under those conditions offer no competition to your overland railroads. I believe the United States should have a merchant marine of its own. Of course building and operating expenses in this country are heavier, but this exclusive coastwise privilege is equal to a subsidy to your merchant marine.

It is time for the American people to get busy and take decisive steps to protect its own interests. There is not a minute to lose. The Panama canal will be open to commerce within three years and ships cannot be built in a day. Legislation should be immediately enacted which would make the country self-contained as a maritime nation.

President Taft also emphasizes the fact that we lack transports and a naval reserve to man them and that we will never have these necessary adjuncts of the navy until we create a merchant marine. The president's exact words are:

> Another instrumentality indispensable to the unhampered and natural development of American commerce is merchant marine. Perhaps nowhere is the need for rapid and direct mail, passenger and freight communication quite so urgent as between the United States and Latin America. We can secure in no other quarter of the world such immediate benefits in friendship and commerce as would flow from the establishment of direct lines of communication with the countries of Latin America adequate to meet the requirements of a rapidly increasing appreciation of the reciprocal dependence of the countries of the Western Hemisphere upon each other's products, sympathies and assistance.
>
> I alluded to this most important subject in my last annual message; it has often been before you and I need not recapitulate the reasons for its recommendation. Unless prompt action be taken the completion of the Panama canal will find this the only great commercial nation unable to avail in international maritime business of this great contribution to the means of the world's commercial intercourse.
>
> Quite aside from the commercial aspect, unless we create a merchant marine, where can we find the seafaring population necessary as a natural naval reserve and where could we find in case of war the transports and subsidiary vessels without which a naval fleet is arms without a body? For many reasons I can not too strongly urge upon the congress the passage of a measure by mail subsidy or other subvention adequate to guarantee the establishment and rapid development of an American merchant marine, the restoration of the American flag to its ancient place upon the seas.

Bid for New Battleship

The Newport News Ship Building & Dry Dock Co., Newport News, Va., submitted the only bid for the construction of the new 27,000-ton battleship authorized to be constructed at a private yard, bids for which were opened by the navy department on Dec. 1. The Newport News company submitted four bids, as follows: Hull and turbine machinery (Parsons type), in accordance with plans and specifications, $5,970,000; with Curtis turbines, $5,775,000; hull and equipment in accordance with specifications; reciprocating engines, $5,830,000; with Curtis turbines, $5,760,000. The company agrees to construct the battleship in 36 months and guarantees 21 knots speed. The sister ship will be built at the New York navy yard. It is pertinent to note that congress appropriated $5,000,000 for this navy-built battleship, which is higher than any of

the bids of the Newport News Co., notwithstanding which the navy department is now asking for an additional million, making seven millions in all, saying that the vessel cannot be built for any less.

Lack of competition for the construction of the battleship is attributed to the provision in the naval appropriation bill that the work must be done in accordance with the eight-hour law. Several ship building firms informed the navy department that a rigid enforcement of the provision, covering not only their own work but the work of sub-contractors as well, would prevent them from undertaking the task within the limits of the appropriation. The Fore River Ship Building Co. sent the following letter to the department:

"Referring to the department's circular of Sept. 27, 1910, inviting proposals under Classes 3 and 4 for the supply and installation of machinery for the battleship which is to be built at the navy yard, New York, and under conditions as amended by the department's memorandum of Nov. 18, 1910, we beg to say that while we seek to supply the propelling machinery of the vessel we regret we cannot see our way clear to submit a bid which will be either satisfactory to us or attractive to the department under the conditions of the circular. Our reasons are as follows:

"First: The necessity of organizing a force at the navy yard to install and erect the machinery under conditions which are in important respects not definitely known.

"Second: The requirements of the circular placing upon the contractor the conduct of the trial trip with guarantees of speed and water consumption which are difficult, onerous and such that it is impossible to prepare an estimate of cost. In our opinion the department which determines all conditions of both hull and machinery, should conduct the trial trip and the contractor be held responsible only for the work performed by him.

"Third: Risk involved in the guarantees is out of all proportion to the part of the contract which the contractor performs since the total cost of the machinery approximately is 28 per cent of the whole cost of the hull and machinery and of this, 20 per cent is in materials which the contractor buys, leaving but 8 per cent representing the labor and expense furnished by the contractor himself."

The new battleships will be the largest in the United States navy and will carry a main battery of ten 14-in. guns.

The General Electric Co., Schenectady, N. Y., was the only bidder for the machinery of the battleships which will be constructed at the New York navy yard. The bid was $352,500.

The bids for the two colliers were beyond the appropriation and will be rejected.

Two Ocean Leviathans

THE Cunard Line has just invited Messrs. John Brown & Co., Ltd., of Clydebank, and Messrs. Swan, Hunter & Wigham Richardson, Ltd., Newcastle-on-Tyne, the builders respectively of the Lusitania and Mauretania, to send in tenders for the largest passenger vessel in the world. She is intended for the Liverpool-New York trade, and will be 885 ft. long by 95 ft. 6 in. broad, a gross tonnage of 50,000 tons, a speed of 23 knots, and will cost about $10,000,000. From these particulars it will be seen that she will be larger than the White Star liner Olympic, recently launched, in length by 2½ ft, in breadth by 3 ft. 6 in., in tonnage by 5,000 tons, and speed by 2 knots. The plans have been approved by Lloyds and the new Cunard lines will be propelled by turbines operating quadruple screws. In appearance she will resemble closely the present Cunard flyers, having four funnels and two pole masts. Her coal capacity will be 6,500 tons, but an important feature in connection with the design of the vessel is that her double bottom will be so arranged that she may carry oil fuel should the introduction of such a method of raising steam appeal to the owners as likely to be advisable. Needless to say, all the fittings throughout the vessel will be of the very finest description. There will of course be an installation of wireless telegraphy, also of submarine signaling. Turkish and electric baths will be among the luxuries provided. There will be a printing establishment for the issue of a daily paper, and also a swimming pond. A theater stage will also be fitted up in the first class lounge. The accommodation to be provided is as follows: First class passengers, 650; second class, 740; third class, 2,400, a total of 3,790, which compares with 2,500 in the Olympic and Titanic, and 2,200 in the Mauretania and Lusitania.

Interesting particulars are now available concerning the mammoth liner which is being built at the Vulcan yard at Stettin for the Hamburg-Amerika service. The vessel, which has not yet been named, has not been designed to create any new record, but in other respects it is claimed that she will be a new creation. Her length is 881 ft., and her gross tonnage 50,000. Her captain's bridge, when the liner is fully loaded, will be 77 ft. above the water line, and the flag at her masthead will be 208 ft. above the water, a fact which can best be appreciated when it is remembered that even the mainmast of the unlucky Preussen, the world's largest sailing ship, reaches a height of only 196 ft. Only a decade has elapsed since the Deutschland, a vessel which created an enormous sensation at the time, was put in commission, but the hull of the new liner is so enormous that the Deutschland could float within it as in a basin, even her funnels being hidden. The Deutschland is only 662 ft. in length, and her gross tonnage is only 16,500. The tonnage of what is at present the Hamburg-Amerika Co.'s largest liner, the Kaiserin Auguste Victoria, is 26,400, and that of the Cunard liner, Mauretania, 30,000, while the Olympic and Titanic, of the White Star line, are 45,000 tons each. The Hamburg-Amerika line has at present 168 ocean-going steamers in commission, with a gross tonnage in the aggregate of 979,217, which will be brought beyond the million when the new boat is launched. On her outward journey the liner will make Southampton her English port of call, and on the return journey from New York she will call at Plymouth. So soon as this new boat is launched work will be commenced upon the small fleet of sister ships.

Bids for Torpedo Boat Destroyers

The navy department opened bids, on Nov. 8, for the construction of six torpedo boat destroyers. The bids submitted were as follows: Fore River Ship Building Co., Quincy, Mass., one boat with Curtis turbines, $648,700; Bath Iron Works, Bath, Me., one boat on department's designs, $669,750, or two for $654,500 each; one boat with machinery, their own design, $655,500, or

two at $630,500 each; New York Ship Building Co., Camden, N. J., one boat on department's designs, $645,000, or with Curtis turbines, $670,000; Union Iron Works, San Francisco, one boat with department's designs, $721,000, or two at $704,000 each, or the same bids obtain with speed reducing gear; Maryland Steel Co., Sparrow's Point, Md., two boats at $685,000 each, or with machinery of their own design at $742,000 each; Newport News Ship Building & Dry Dock Co., Newport News, Va., one on department's designs at $635,000; William Cramp & Sons Ship & Engine Building Co., Philadelphia, one on department's designs, at $658,000. The bids will be rejected as under the operation of the eight-hour law an additional appropriation would be required to meet the bids.

Arrival of Tug Miraflores

The tug Miraflores arrived in Panama Bay on the morning of Nov. 4, having made the trip up the west coast of South America from Valparaiso, Chile, in about 10 days, which was considerably better time than it made during the previous part of its voyage. It left the yards of Pusey & Jones, Wilmington, Del., on Aug. 12, the builders having made a contract for delivery at a stipulated price. The first stop was at Barbados, where the tug was in dry dock for eight days. It then continued on its voyage around South America, meeting with almost continuous rough weather until after it had passed through the Strait of Magellan. Stops were made at Barbados, Pernambuco, Montevideo, Sandy Point, Coronel and Callao. All but three members of the original crew deserted during the voyage, the vessel reaching its destination with 12 men, besides the captain and mate. The tug showed the effects of the rough voyage in its weather-beaten sides, while two or three panels in the deck house had been splintered by heavy seas. The breakwater at the bow, as shown in the photograph, was simply put on for the trip. Immediately after its arrival at Balboa, after the voyage of 13,000 miles, the Miraflores was given a speed trial and made 10 knots in 42 minutes.

The Miraflores is 118 ft. 6 in. over all, 23-ft. beam and 12-ft. 6-in. depth molded. The engine is triple-expansion, 13, 21 and 32-in. cylinder diameters by 24-in. stroke. The boiler is 14 ft. diameter, 12 ft. 6 in. long, with three furnaces, 46 in. diameter.

TUG MIRAFLORES OF THE ISTHMIAN CANAL COMMISSION'S FLEET.

Municipal Dock at Tacoma

At the November election the citizens of Tacoma authorized the city officials to issue bonds in the amount of $405,000 for the purchase of a site and the construction of a municipal dock on the city waterway and voted down the proposed issue for the purchase of a fire tug to protect its waterfront. The shipping men of the port fought hard for the latter measure, while they opposed the passage of the municipal dock measure which the city authorities were forwarding. They argued that the city should make some provision to protect its present docks and big lumber mills along the front before it placed any more buildings there. At present the waterfront is poorly protected, although tentative plans have been made to place a high pressure fire main system along the city waterway and the bay front.

The proposed dock is to be four stories high, 300 ft. long and 80 ft. in depth, and will be a reinforced concrete structure costing approximately $120,000. A wide viaduct will be built from Twelfth street to the upper story of the dock, which will allow teams to drive from the heart of the business district directly upon the dock to unload freight without encountering any grades or heavy hauls. The tentative plans provide for the installation of elevators which will take both freight and passengers from the fourth floor to the steamer landing.

Pacific Coast Casualties

The heavy gales off the north Pacific coast during November reaped a small harvest in wrecked steamers and sailing craft and seriously handicapped shipping for more than two weeks. The wooden steamer Portland, owned by the Alaska Coast Co., and one of the most famous vessels plying in the Alaska trade, was one of the victims, although she first grounded in a smooth sea. The Portland was bound from Tacoma and Seattle to Valdez when, at 6 a. m., Nov. 12, she struck an uncharted reef off Martin island. There was practically no sea at the time but, owing to the heavy fog, the ship had worked closer inshore than is customary in those waters. Excellent discipline prevailed and Capt. Moore beached her at the mouth of the Katalla river. Within an hour a heavy sea had sprung up and the passengers and mail had hardly been taken off before the ship began to break up. Attempts to take out her cargo failed and she is now practically a total wreck. First reports from the scene of the accident were to the effect that the passengers were suffering from famine, but this was later found to be erroneous, as the Portland was carrying a large stock of provisions north to the Alaska ports and the supplies were consequently ample.

The British steamer Sechelt met with her second mishap in three months when she hit the reefs off Bowen Island, about 40 miles from Vancouver, B. C., on Nov. 5. The passengers were taken off and part of her cargo salved. She will probably be a total loss. The steamer is owned by the Sechelt Steamship Co., of Vancouver.

Tug for Port of Portland

Bids will be advertised for about Jan. 1, 1911, for the construction of a steel sternwheel tug for the port of Portland commission. Plans and specifications are being drawn by Architect C. H. Norrlin, who designed the tug Oneonta, recently completed for the Port of Portland. The new stern-

wheeler will be 180 ft. long, 34 ft. beam and have a draught of 9 ft. The hull will be of steel throughout, and the superstructure and stack will be low enough to pass under the draw bridges at low water. The new tug will have 1,800 horsepower and will be fitted with steam towing machine. Her cost is estimated at about $100,000, and it is expected she will be completed in time for the opening of the 1911-1912 grain service on the Columbia river. The Port of Portland at present has but one towboat that can be used for handling ships in the river.

Steam Yacht Aquilo

Aquilo, the fine steam yacht used by James A. Moore and Herbert T. Low, of the Western Steel Corporation, to take visitors to the steel plant at Irondale from Seattle, Vancouver and other Puget sound points, is a notable addition to the pleasure vessels of Puget sound. The Aquilo was built by George Lawler of East Boston, being

STEAM YACHT AQUILO.

brought around the Horn and delivered to her present owners in May, having made the trip in 62 steaming days. She is a steel, ocean-going yacht, 156 ft. over all, 22 ft. beam, and averages 15 knots an hour. Her engine is triple-expansion, 10¾, 17 and 27-in. cylinder diameter by 18-in. stroke, supplied by two vertical oil-burning water-tube Almy boilers. The boat is lighted throughout by electricity supplied by a 7-K. W. General Electric lighting plant generator, driven by a 5-in. x 4½-in. marine engine, at 550 revolutions per minute. The engine room is amidships with dining room and cabin forward, and staterooms and library aft, fitted to comfortably sleep eight guests. Three decks are the lower, main and bridge, with the navigating bridge and aft main deck covered with long canopies. Below decks the Aquilo is finished in blue and white with beamed ceiling and mahogany furniture.

Three New Steamers

Contracts will be awarded about the middle of this month by the Northwestern Fisheries Co., at Seattle, for the construction of three steamers to be used on the Sushitana river in Alaska. A number of the Portland and Puget sound ship builders are figuring on the plans. One of the vessels will be a single screw tug, 108 ft. in length over all, for use at the entrance of the river, and the other two will be used in the passenger and freight trade on the river. One will be 108 ft. in length and the other 110 ft. They will be stern wheelers, of light draught because of the shallow channel, and are to be equipped with tandem compound condensing engines.

Car Ferry Ann Arbor No. 5

Car ferry Ann Arbor No. 5, building for the Ann Arbor Railroad, was launched from the yard of the Toledo Ship Building Co., Toledo, on Nov. 26, being christened by Miss Katherine Holliday, daughter of W. D. Holliday, assistant to the president of the Ann Arbor Railroad. The new car ferry is 378 ft. over all, 350 ft. keel, 56 ft. beam and 21 ft. deep. Her machinery consists of two triple expansion engines, cylinders 21, 33 and 52 in. diameter by 40 in. stroke, allowed 185 lbs. pressure and designed for 100 revolutions per minute. She has four Scotch boilers, 13 ft. 6 in. diameter and 12 ft. long, each containing two 50 in. Morrison suspension furnaces, fitted with heated forced draft. She has four tracks and will carry 28 freight cars of the largest size or 32 of ordinary length. The hull is designed for ice breaking purposes. It is interesting to note that a hinged gate has been fitted at the stern 5 ft. 6 in. high.

The electric light plant consists of two 15-kilowatt General Electric Co.'s generators, the wiring carried in metal conduit below the spar deck. The vessel is wired for about 550 lamps and is equipped with one 19 in. search light, hand operated on top of the pilot house, and one 19 in. dispersion lens on the stern.

Mr. Goulder's New Firm

Mr. Harvey D. Goulder has sent out an announcement regarding the personnel of his law firm, which has been undergoing reorganization lately. The firm now includes William W. White, who has been associated with Mr. Goulder for the past nine years; Luther Day, son of Hon. William R. Day, of the United States supreme court, who has been engaged in general practice in Canton; Thomas H. Garry, who resigned the position of assistant United States attorney for the northern district of Ohio; O. D. Duncan, graduate of the naval academy at Annapolis, who, for some years, has been in admiralty practice in New York City; and Robert McCreary, who has been with Mr. Goulder for several years.

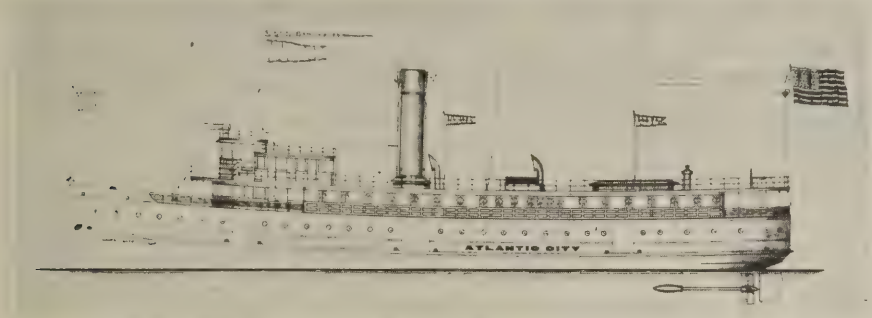
William McKie, East Boston, Mass., is to build two steamers for the Boothbay section of the Eastern Steamship Co., to be 120 ft. long, 20 ft. beam, and 8 ft. deep. The Atlantic works, East Boston, will supply the engines.

Lloyds returns indicate that, exclusive of warships, there were 368 vessels of 1,154,197 tons gross under construction in Great Britain at the close of the last quarter. The tonnage now under construction is about 36,000 tons more than that which was in hand at the end of last quarter and exceeds by 376,000 tons the total building 12 months ago.

Steamer for Atlantic City Transportation Co.

M. C. Furstenau, naval architect of Philadelphia, has designed for the Atlantic City Transportation Co., Atlantic City, N. J., a small freight and passenger steamer for service between Atlantic City and New York. Her principal dimensions are as follows: 195 ft. 6 in. over all, 185 ft. between perpendiculars, 28 ft. 6 in. breadth molded, 37 ft. 6 in. breadth over guards, 13 ft. 6 in. depth over lowest point of sheer.

The hull will be constructed entirely of steel up to the promenade deck. The arrangement of the hold space



PROFILE OF STEAMER FOR THE ATLANTIC CITY TRANSPORTATION CO.

will be as follows: Collision compartment; cold storage compartment, boiler room; engine room; buffet; galley, and crew's quarters. The main deck will be arranged for general cargo. On port and starboard sides abreast of the engine room will be located the crew's quarters and wash room and after this will be the social hall and dining room, which will be finished in mahogany. The staterooms and general saloon will be on the promenade deck and will be finished in white pine with mahogany trimming.

The propelling machinery will consist of two 3-crank, triple-expansion engines with cylinders 14¼, 23¼ and 36 in. diameters by 26 in. stroke, supplied with steam from two water-tube boilers.

Proposals for building this steamer were opened on Sept. 27, the bid of the Harlan & Hollingsworth Corporation, Wilmington, Del., at $165,000 being the lowest. Contract, however, has not yet been awarded.

Contracts for Lake Steamers

An excellent shipbuilding program is being lined up for lake ship yards this winter, notwithstanding the apparent surplus of vessel tonnage on the lakes. The Pittsburg Steamship Co. has been authorized by the United States Steel Corporation to build two 600-foot steamers for 1911 delivery. They will be built on the Isherwood system, though contracts have not yet been let. The Jones & Laughlin Steel Co. will build a 600-footer to replace the W. C. Moreland, wrecked on Eagle river, Lake Superior. She will be a duplicate of the Moreland, and will be built by the American Ship Building Co. The interests of which William P. Snyder, of Pittsburg, is the head, will shortly invite proposals for two of the largest vessels on the lakes, to be 615 feet over all and to be constructed on the new longitudinal system. They will also be somewhat of a departure in that the side tanks will be carried to the spar deck and that the cargo bulkheads instead of being carried straight from the spar deck to the tank top, as is the usual practice, will be so carried for only half the distance, and will then slope to the tank top in both fore and aft directions, describing an inverted V with a reach of about 10 ft. thus making the hopper construction athwartships as well as fore and aft. This formation of bulkhead will naturally further tend to the concentration of the cargo, a desirable feature in unloading. Moreover it is understood that all the auxiliary machinery is to be turbine-driven. While bids will be solicited for two steamers the two, however, may not be built at once.

The American Ship Building Co. has secured contract from the Standard Oil Co. for the construction of a steamer and barge to carry oil in bulk. They will be of Canadian canal dimensions, 260 ft. over all, 250 ft. keel, 43 ft. beam and 23 ft. deep. It is interesting to note that the steamer will be fitted for burning oil fuel. Both vessels will be built at the Cleveland yard.

The Niagara, St. Catherines & Toronto Navigation Co., St. Catherines, Ont., has given contract to the Collingwood Ship Building Co. for a new steamer for service between Port Dalhousie and Toronto. The new steamer will be 200 ft. long and will be designed to carry about 1,000 passengers and 300 tons of freight.

A WONDERFUL PHOTOGRAPH.

Photograph by Frank & Sons, South Shields.

Three-quarters of a mile of river frontage; the shipyards, engine works, and dry docks of Messrs. Swan, Hunter, & Wigham Richardson, Ltd. at Walker and Wallsend-on-Tyne, England. Viewed from left to right are seen successively the S. S. Sidi Brahim, passenger steamer for the Transports Maritimes of Marseilles; the S. S. Carthage, 19½ knot mail steamer for the Cie Generale Transatlantique; the Neptune Engine Works; the 150-ton floating crane; ships building under the overhead electric cranes; the Dry Docks Department with two floating Docks and the Cairn Line S. S. Tortona in the graving dock; the great glass-roofed building sheds where the Mauretania was built and from which the Cunard Co.'s S. S. Franconia is being launched; the bottom plating of the British Admiralty floating dock to lift 32,000 tons; the east yard glass-roofed building sheds and the Indra Line S. S. Indrabarah alongside.

Ore Shipments

Ore shipments during November were 2,641,886 tons, making the total shipments for the season 42,620,201 tons, a gain of 936,328 tons over 1909, when 41,683,873 tons were moved. This establishes a record for the lakes, though it falls far short of the promises of the early part of the season. When navigation opened in the spring of 1910 the ore movement began with a rush and kept up a tremendous clip during the summer months. The movement during June was 7,316,592 tons, which is the highest movement ever achieved in the trade. After that the pace slackened, the July movement being under 7,000,000 tons and thereafter the record of 1909 was not equalled. The slump became especially marked after Oct. 1, but the movement of the early months was so heavy as to prevent the total movement of 1910 falling below that of 1909.

The season is distinguished in the fact that the ore movement ceased on Nov. 30. No ore was moved during December. In fact, with a few cargoes of grain and a belated cargo or two of coal, the lake season came to an abrupt end on Nov. 30.

It will be understood that a few cargoes were moved after Dec. 1, 1909, which, of course, slightly diminishes the increase of 1,455,842 tons as shown in the following table of shipment by port:

Port.	November 1909.	November 1910.
Escanaba	701,646	452,351
Marquette	369,478	250,426
Ashland	600,469	276,612
Superior	758,073	635,002
Duluth	1,446,288	519,893
Two Harbors	1,023,266	508,062
	4,899,220	2,641,886

Port.	To Dec. 1, 1909.	To Dec. 1, 1910.
Escanaba	5,632,421	4,959,869
Marquette	2,877,191	3,248,929
Ashland	3,736,744	4,093,822
Superior	6,505,527	8,437,261
Duluth	13,296,326	13,609,155
Two Harbors	9,116,150	8,271,165
	41,164,359	42,620,201
1910 increase		1,455,842

Data of Battleship Delaware's Trials

The navy department has tabulated the results of the official trials of the battleship Delaware which occurred on Aug. 6, last. The Delaware was built by the Newport News Ship Building & Dry Dock Co. The Delaware is 510 ft. long and 85 ft. 2½ in. on load water line. Her keel was laid Nov. 11, 1907, and she was launched Feb. 6, 1909. Her displacement at the beginning of the four-hour trial was 20,863 tons and at the conclusion of the 24-hour trial was 20,190 tons. Her speed on the four-hour run was 21.46 knots and on the 24-hour 19-knot run was 19.68. The steam engineering data for these runs is as follows:

FOUR-HOUR FINAL TRIAL.		24-HOUR FINAL TRIAL.	
Average speed, knots	21.46	Average speed, knots	19.68
Average R. P. M.	127.6	Average R. P. M.	111.76
Average I. H. P.	27,264	Average I. H. P.	18,722
Average coal per hour per I. H. P., all purposes	1.87	Average coal per hour per I. H. P., main engines	1.51
Average steam pressure at engine (gage)	248.5	Average steam pressure at engine (gage)	210.5
Average vacuum	24.7	Average vacuum	25.45
Average temp. injection	71.5	Average temp. injection	74.5
Average temp. discharge	114	Average temp. discharge	110
Average temp. feed water	226.5	Average temp. feed water	215
Average revs. forced draft blowers	759	Average revs. force draft blowers	650

STEAM CONSUMPTION.

	Knots.	Lb.	Knots.	Lb.	Knots.	Lb.
Water per I. H. P. per hour, main engines only	12	15.48	19	12.7	21	12.9
Water per I. H. P. per hour, all purposes	12.24	21.05	19.225	14.52	21.563	14.8
Total water per hour, all purposes	12.24	83,413	19.225	250,549°	21.563	422,931
Total water per hour, for main engines only	12	55,000	19	205,000	21	312,000

° Includes about 7,500 lb. of make-up feed.

State of Industry

General business throughout the country is only fair, according to a canvass of the 3,000 members of the National Association of Manufacturers, which has just been completed by that organization. About 2,000 answers were received in reply to the set of questions presented to each member by the officers of the association and a tabulated statement of the individual replies, properly classified, is given in the current issue of the American Industries, the official organ of the National Association of Manufacturers. Each member of the association was asked to state how he estimated the improvement in sales and collections the past twelve months, what he considered to be the present state of trade conditions and what was the outlook for next year.

"There is no calamity in sight, nothing so menacing that people need be unduly alarmed, but conditions are unsatisfactory, and they can and should be improved," says H. H. Lewis, secretary of the association, in summing up the result. Mr. Lewis says that, while some industries are really prosperous, the average is below normal. He attributed three reasons for this condition, namely, national irritation, speculation and internal dissension.

SUMMARY OF NAVAL CONSTRUCTION.

Name of Vessel.	Building at.	1910: Per cent of completion. Sept. 1.	Oct. 1.
BATTLESHIPS.			
Florida	Navy Yard, New York	74.2	77.4
Utah	New York S. B. Co.	85.5	88.0
Wyoming	Wm. Cramp & Sons	35.5	38.9
Arkansas	New York S. B. Co.	43.9	47.8
TORPEDO BOAT DESTROYERS.			
Paulding	Bath Iron Works		*
Drayton	Bath Iron Works	91.7	94.4
Roe	Newport News S. B. Co.	99.3	100.0**
Terry	Newport News S. B. Co.	93.5	99.0
Perkins	Fore River S. B. Co.	93.8	97.4
Sterett	Fore River S. B. Co.	89.8	90.8
McCall	New York S. B. Co.	95.5	95.9
Burrows	New York S. B. Co.	92.7	94.9
Warrington	Wm. Cramp & Sons	81.4	84.7
Mayrant	Wm. Cramp & Sons	82.0	83.7
Monaghan	Newport News S. B. Co.	31.3	35.6
Trippe	Bath Iron Works	62.6	68.3
Walke	Fore River S. B. Co.	52.8	57.5
Ammen	New York S. B. Co.	65.4	72.4
Patterson	Wm. Cramp & Sons	44.6	47.8
SUBMARINE TORPEDO BOATS.			
Carp	Union Iron Works	62.0	63.0
Barracuda	Union Iron Works	62.7	64.8
Pickerel	The Moran Co.	58.1	61.1
Skate	The Moran Co.	58.1	61.1
Skipjack	Fore River S. B. Co.	54.0	56.3
Sturgeon	Fore River S. B. Co.	52.5	55.4
Thrasher	Wm. Cramp & Sons	10.8	15.7
Tuna	Newport News S. B. Co.	31.8	32.4
Seal	Newport News S. B. Co.	54.4	55.9
No. 28	Union Iron Works		No report.
No. 29	Union Iron Works		No report.
No. 30	The Moran Co.		No report.
No. 31			No report.
COLLIERS.			
Cyclops	Wm. Cramp & Sons	89.9	98.4
Neptune	Maryland Steel Co.	43.2	47.8

*Delivered Portsmouth yard, Sept. 27, 1910.
**Delivered Norfolk yard, Sept. 15, 1910.

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BOTH

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OUR RIGGING LOFT

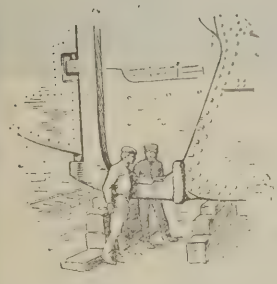
Will be glad to look after your mooring lines, wheel ropes, rigging, etc.

These things should be looked after at once, before the crew leaves for the Winter, for if left until Spring, when everything is hustle and bustle, your boat may be delayed.

Send in now, whatever needs overhauling, and we can take more care to put it in first class shape. We will be glad to hold it over Winter and ship back to the boat when she is fitting out next Spring.

THE UPSON-WALTON CO.

CLEVELAND, O.



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Process sanctioned by the British Corporation for the Survey and Registry of Shipping.

The Thermit Process enables you to weld broken sternposts, rudder frames, shafts, etc., without removing them from the vessel. All of our appliances are portable and may be brought to the job. No outside power is required with the exception of a small supply of compressed air.

Thermit is a mixture of finely divided aluminum and iron oxide which burns up and produces liquid steel at a temperature of 5,400° F. This is poured into a mould surrounding the broken sections and the intense heat of the Thermit steel causes it to dissolve the metal with which it comes in contact amalgamating with it to form a homogeneous mass when cool.

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The national irritation, he believes arises mainly from political agitation. He especially urges that the tariff question be taken out of politics.

"The problem must be settled," he says, "and our business interests are becoming unanimous in realizing that the only practical and satisfactory solution is the tariff commission form of investigation. In passing it may well be understood nowhere is the need of an independent tariff commission more clearly recognized than among the manufacturers who are popularly supposed to be the actual beneficiaries of high protection."

Rust and Scale Remover

With establishments handling structural shapes, plates, etc., the problem of removing scale and rust from the pieces before fabricating is a serious one, both as regards expense and time.

Where the raw material is unloaded and stocked in a storage yard and cut to size before it goes into the shop, scraping, brushing with wire brushes, emery grinders, sand blast,

REMOVING RUST AND SCALE FROM STRUCTURAL MATERIAL WITH THE B. H. ROTARY CLEANER.

etc., have all been tried and all have been found to have serious defects, being either too expensive, too slow, ineffective, inconvenient, or otherwise undesirable. The Brown Hoisting Machinery Co., Cleveland, have developed a tool in their own works which is said to entirely eliminate the faults of these other methods, and after a thorough test on actual work it has given such excellent results that it has been patented and is now being placed on the market under the name of the B. H. Rotary Cleaner.

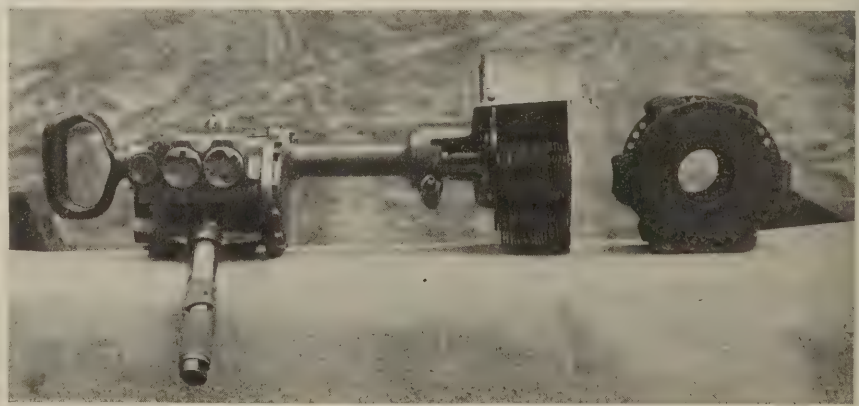
The B. H. rotary cleaner, as will be noted from the illustrations herewith, consist of two disks on the same hub carrying at their perimeters a series of pins on which are loosely mounted steel blades or cutters. These blades are rectangular in shape and the hole by which they are supported on the pin is elongated, so that in revolving they have a maximum efficiency.

This tool is attached to and driven by a high-speed pneumatic or electric grinder. Its effectiveness is due to the chipping action of the rapidly revolving blades, which accounts for its remarkable efficiency in removing scale and rust from structural material. It is simple in design, has interchangeable parts and is free from jar.

It is claimed that one man with a B. H. rotary cleaner can do the work of eight or ten men with scrapers or brushes and at the same time get better results. Other uses for the B. H. rotary cleaner, such as cleaning castings, surfacing stones, cleaning bottoms of ships, etc., will readily suggest themselves.

STRUCTURAL STEEL BEFORE AND AFTER CLEANING WITH THE B. H. ROTARY CLEANER.

The steamer Riker's Island, built for the department of correction of New York City, by the Waters-Colver Co. of West New Brighton, Staten Island, underwent a satisfactory trial trip on Nov. 21. This steamer was designed by M. C. Furstenau, naval architect of Philadelphia.



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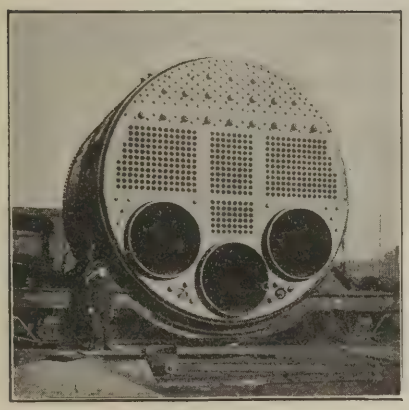

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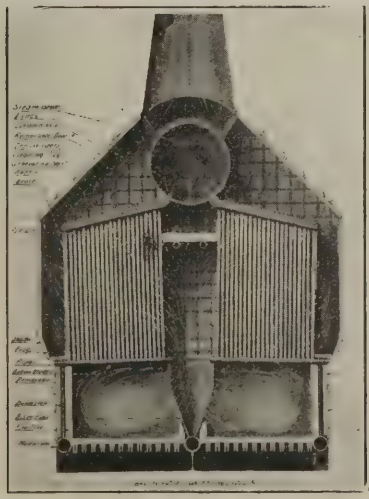

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All Generating Tubes and Headers seamless drawn steel tubes

PERFECT CIRCULATION --- NO SEDIMENTS --- DRY STEAM

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Terminals of tubes expanded in place
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Every Tube and Section can be taken out and replaced without disturbing any other Tube or Section

Perfect Combustion --- Light Weight --- Greatest Efficiency

CATALOGUE AND PRICES ON APPLICATION

LAKE VESSEL ACCIDENTS FROM OCT. 6 TO CLOSE OF NAVIGATION

DATE.	NAME OF VESSEL.	NATURE OF ACCIDENT.	LOCATION.
Oct. 6	Tug Wm. Kennedy	Got line in her wheel and was towed to dock by tug John M. Truby	Cleveland harbor.
Oct. 6	Str. Turret Court	Stuck across channel, blockading traffic; released Oct. 7	Cuyahoga river.
Oct. 7	Str. Martin Mullen	Ran aground; released on 8th, after lightering 150 tons of ore, uninjured	Outside of Huron harbor.
	Str. J. A. McGean	Struck at entrance to harbor; docked at Lorain	Indiana harbor.
Oct. 8	Str. North Sea	Struck while entering; damage unknown	Buffalo harbor.
Oct. 8	Str. Sacramento	Ran into a reef; washed off by heavy seas on 9th and proceeded to Houghton; only slightly injured	Off Big Bay Pt., Lake Superior.
Oct. 9	Str. Roumania	Lost her rudder; drifted about all day; tugs unable to assist her, owing to heavy sea; towed back to Cleveland, where she unloaded her coal cargo and was docked	Lake Erie, off Gordon Park.
Oct. 9	Str. Glenmount	Ran ashore in wind storm	Pipe Island, Lake Huron.
Oct. 13	Str. Martin Mullen	Collided with str. James H. Reed in thick weather; bow smashed in and both anchors lost; beached; released on 14th and taken to Detroit for temporary repairs; docked at Superior, Oct. 22	St. Clair river, near Joe Bedore's landing.
Oct. 13	Str. James H. Reed	Collided with str. Martin Mullen; damaged on port side, one anchor lost; leaked; No. 1 tank leaked; air compressor put aboard by wreckers on 14th and taken to Detroit; towed from there to Lorain, where she was docked	St. Clair river.
Oct. 14	Str. C. C. Hand	Lost her rudder; towed to Toledo by tugs	Detroit river.
Oct. 15	Str. J. S. Ashley	Ran aground in thick weather; released later in day, uninjured	Squaw Isl., St. Clair river.
	Str. J. G. Munro	Collided with str. Peter White; six plates damaged and hawse pipe broken; damage about $5,000	Superior ship canal.
	Str. Peter White	Collided with str. J. G. Munro; four plates and ten frames damaged; loss about $5,000	Superior ship canal.
Oct. 18	Str. W. C. Moreland	Ran on rocks; wreckers ordered to her immediately, but owing to severe weather, could work on her only four days out of 14; abandoned by owners as constructive total loss on Nov. 2; steamer practically broken into three parts; loss to underwriters about $500,000; largest vessel ever lost on the lakes	Eagle river, Lake Superior.
Oct. 21	Str. J. W. Westcott	Stranded; part of lumber cargo thrown overboard; released on 24th	Sister Isl. Shoal, Green Bay.
Oct. 21	Str. B. F. Berry	Got stuck in Erie railroad draw and had to be towed back to C. & P. dock to lighter; docked at Lorain Nov. 5; eight plates damaged	Cleveland.
Oct. 22	Str. Sinaloa	Ran aground on sand bar while entering harbor in wind storm; released on 27th, after pulling on her continuously for four days and lightering 55,000 bu. grain; not injured	Buffalo harbor.
Oct. 22	Str. Arlington	Became disabled in heavy sea; picked up by str. Utley and towed to Milwaukee; cylinder head broke	Lake Michigan.
Oct. 22	Str. Lycoming	Destroyed by fire; wreck sank in 17 ft. of water	Rondeau, Lake Erie.
Oct. 23	Str. Langham	Burned to water's edge and sank in 120 ft. of water; total loss; loaded with coal; insurance, $45,000	Off Keweenaw Pt., Lake Superior.
Oct. 24	Str. Choctaw	Collided with str. America while lying at Kemp's coal dock; three plates damaged; temporarily repaired	Soo river.
Oct. 24	Str. America	Collided with str. Choctaw; arrived in Cleveland Oct. 27 and went into dry dock	Soo river.
Oct. 25	Str. City of Berlin	Towed into Sturgeon Bay, disabled, as result of blowing out of her boiler head; one fireman fatally burned; towed to Manitowoc for repairs	Lake Michigan.
Oct. 26	Mud scow	Collided with str. Sierra and sank immediately. Crew escaped	Buffalo.
	Str. Helen C	Stranded on rocks; bottom damaged; released on 27th, after lightering 100,000 ft. of lumber; docked for repairs	Vessel Point, near Sault.
Oct. 28	Bge. S. D. Warriner	Struck; released after lightering 500 tons of ore cargo; leaked; towed to Cleveland and was docked Nov. 2; 26 damaged plates	Ballard's Reef, Detroit river.
	Str. Turret Chief	Ran ashore; forward tank leaked; docked at Collingwood	Tombstone Isl., Georgian Bay.
Oct. 29	Str. Republic	Ran aground at north entrance; floated on 30th by the tide; number of damaged plates; repaired at Buffalo	Buffalo harbor.
Oct. 29	Str. Glenmount	Arrived at Montreal in badly damaged condition as result of encountering storm	Lake Erie.
Oct. 29	Str. Advance	Machinery became disabled; towed to Sault by tug Thompson and repaired before proceeding	Whitefish Bay.
Oct. 29	Str. Manitou	Collided with str. Venezuela; forward works and bow damaged; repaired at Hickler's ship yard; Venezuela not injured	Off Pt. Iroquois, Upper St. Mary's river.
Nov. 2	Str. C. W. Kotcher	Stranded, almost completely blocking channel; Nos. 34 and 5 compartments full of water; two air compressors put aboard; released on the 3d, after lightering 1,200 tons of coal cargo; docked Nov. 13 at Milwaukee, repairs will cost about $40,000; 60 damaged plates, 23 of which must be replaced with new ones	Limekiln Crossing, Detroit river.
Nov. 2	Str. Binghamton	Collided with str. Rochester; slightly damaged	Buffalo harbor.
Nov. 2	Str. Rochester	Collided with str. Binghamton; slightly damaged	Buffalo harbor.
Nov. 4	Derrick scow	Sank during night while lying at dock; scow overturned and boiler fell to bottom of river; boat will be floated	Lorain.
Nov. 4	Str. B. F. Berry	Struck Erie avenue bridge; railing and walk of bridge considerably damaged; steamer not injured	Lorain.
Nov. 5	Sand sucker	Hit by str. Northern Queen; crushed against dock and rent almost her entire length; listed and turned turtle; vessel and cargo valued at $6,000; crew scaped	Blackwell canal.
Nov. 5	Str. Northern Queen	Collided with str. West Shore; not seriously damaged	Blackwell canal.
Nov. 5	Str. West Shore	Collided with str. Northern Queen; after part of steamer badly damaged	Blackwell canal.
Nov. 5	Str. R. L. Ireland	Ran aground at foot of Jefferson avenue; released on 6th	Toledo.
	Str. J. H. Sheadle	Ran aground; docked at Ecorse, Nov. 6	Soo river.
Nov. 6	P'k'g. f'r't'r. Wasoga	Burned; total loss; vessel valued at $30,000, cargo at $56,000	Copper harbor, Lake Superior.
Nov. 7	Schr. Bottsford	Struck Central viaduct; lost her foremast	Cleveland.
Nov. 8	D. O. Mills	Grounded; released, uninjured	Off Harmon Park, Lake Erie.
———	Str. M. A. Hanna	Struck an obstruction, breaking two buckets off her wheel; left Sault Nov. 9 after completing repairs	Mud lake.
Nov. 8	Str. Carleton	Ran ashore; released by tugs, uninjured	Near Port Dalhousie.
Nov. 10	Str. D. R. Hanna	While coming out broke away from tugs and ran on beach near entrance; released Nov. 13, uninjured	Indiana Harbor.
Nov. 11	Str. Powell Stackhouse	Ran aground; released Nov. 12; uninjured	Near Amherstburg, Detroit river.
Nov. 11	Pkg. frtr. Northern Queen	Cracked two plates; to be repaired at Superior	Duluth.
———	Str. Panther	Ran ashore and filled with water; after futile efforts to release her, abandoned for the winter; work on her to be resumed in spring	Grand Island, Lake Michigan.

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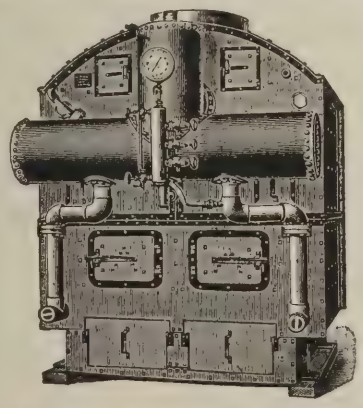

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Simple design, perfect circulation, large combustion chamber; greatest heating surface possible in fire box; latest and most efficient method of separating steam from water; water in sufficient quantity to prevent excessive fluctuation; mud-drum to receive precipitation; expansion provided for every part; accessibility of all parts for cleaning and repairs; small space required; strength, weight and durability.

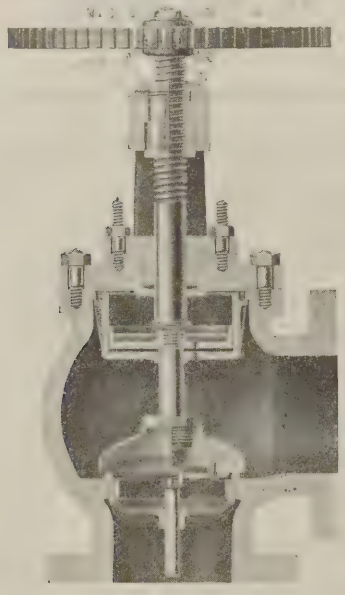
350 Steam Vessels now using Almy Boilers, testify of their excellence

Almy Water-Tube Boiler Co. PROVIDENCE R.I., U.S.A.

DATE.	NAME OF VESSEL.	NATURE OF ACCIDENT.	LOCATION.
Nov. 21	Str. Australia	Hit the dock while winding and broke her quadrant; repairs completed Nov. 25	Ashtabula.
Nov. 25	Bge. Sligo	In putting in for shelter, barge missed pier, let go her anchor, and went on the beach; crew remained aboard	Cobourg, Ont.
Nov. 25	Fish tug Dispatch	Picked up in disabled condition by car ferry Marquette and Bessemer No. 2 and towed to Port Burwell	Lake Erie.
Nov. 26	Str. Viking	Lost her rudder	Lake Michigan.
Nov. 27	Str. Alaska	Totally destroyed by fire while lying at Tobermoray for shelt r	Tobermoray, Lake Huron.
Nov. 29	Str. Pollock	Ran ashore in snow storm; out 6 in.; released Dec. 1 and proceeded on trip	St. Martin's Reef, St. Mary's river.
Nov. 30	Tug General	Sunk in collision with Canadian str. Athabasca; three members of crew drowned; hit on port side abreast of engine room and almost cut in two; sank almost instantly in 55 ft. of water; total loss, valued at $25,000; not insured	Sault river.
Nov. 30	Str. Smith Thompson	Ran aground in snow storm; out about 7 in. forward; released Dec. 1, uninjured	Detroit river.
Nov. 30	Str. Onoko	Ran ashore in snow storm; out 2 ft. forward and 1 ft. aft; released Dec. 2, after lightering part of cargo; not damaged	Pt. Au Pelee, Lake Erie.
Dec. 4	Car ferry Marquette and Bessemer No. 1	While loading, several empty cars broke loose and tipped stern of boat, breaking coupling which connects apron to ferry and demolishing apron; several loaded cars on upper deck broke loose, their weight moving boat away from dock; four loaded cars dropped into creek, while two others are hanging over her stern.	Conneaut.

New Automatic Stop and Check Valve

A new type of valve for heavy pressure and which is designed to automatically shut off the flow of steam from the header to a boiler in case of rupture of a tube or other part, thereby suddenly reducing the pressure in the boiler, has been brought out by Jenkins Bros., 71 John street, New York. These valves also equalize the pressure between the different



boilers in a battery. As they can only be opened by the pressure in the boiler to which they are attached, it is impossible to accidentally turn the steam into a boiler which is being cleaned. The valves are cushioned to prevent chattering, by an internal dashpot made of bronze which eliminates the danger of sticking through the corrosion of dashpot or piston. Care is urged that the valves be installed in a vertical position only. The metal throughout is the best quality of cast iron with steam metal mountings and each valve is given a factory test of 800 lbs. as hydraulic pressure.

Ship Building During November

The bureau of Navigation reports 70 sail and steam vessels of 16,349 gross tons were built in the United States and officially numbered during the month of November, 1910, as follows:

	Wood. Sail.		Wood. Steam.		Steel. Steam.		Total.	
	No.	Gross.	No.	Gross.	No.	Gross.	No.	Gross.
Atlantic and gulf	5	139	25	1,291	3	6,355	33	7,785
Pacific	2	67	11	151	..	.....	13	218
Great lakes	..	...	6	90	3	7,760	9	7,850
Western rivers	..	...	15	496	..	.....	15	496
Total	7	206	57	2,028	6	14,115	70	16,349

Some Old Vessels

Among the vessels still on the register of the Danish government are some examples of ancient construction including the following: The Constance, 27 tons, 1723; Marie, 34 tons, 1776; Erik Hansen, 49 tons, 1786; Twende Brodre, 74 tons, 1786; Defire Brodre, 14 tons, 1794; Albertine, 68 tons, 1794; Thora Johanne, 34 tons, 1807; Ebenezer, 20 tons, 1810. These vessels are in active trading on the Baltic and some of them regularly cross the North Sea with all kinds of cargoes including granite and other heavy goods. It would be of interest to know whether there are vessels actually older than these in active service.

Personal

John Haug, consulting engineer and naval architect, has opened an office at No. 24 California street, San Francisco, Cal. Mr. Haug's experience has been very extensive. For twenty years he was ship and engine surveyor for Lloyds Register at Philadelphia, furnishing designs for the Red "D" Line of steamships, the New York & Porto Rico Steamship Co., the Chesapeake Steamship Co., of Baltimore, and the Standard Oil Co., of New York. For the past five years he has been engineer-in-chief of the marine department of the Standard Oil Co. of California.

Items of General Interest

H. S. Fitz Gibbon has been appointed general manager of the New Jersey Asbestos Co., New York.

Alexander Sang, Duluth, Minn., was the lowest bidder for building pierhead crib and riprap embankment at Ashland, Wis. His bid was $7,874.25.

The Great Lakes Dredge & Dock Co., Chicago, was the lowest bidder for building the part rubble mound breakwater at Superior Entry, Wis. Its bid was $145,200.

The Revere Rubber Co., of Boston, has been awarded contract by the United States government for supplying the suction hose to be used in raising the battleship Maine in Havana harbor.

The National Rivers and Harbors Congress opened its seventh convention at the New Willard hotel, Washington, D. C., Dec. 7, 8 and 9. The congress is pledged to a waterway policy and not to a waterway project.

The 1911 edition of the Record of American and Foreign Shipping, published by the American Bureau of Shipping, is now ready for distribution. The rules have been revised and rearranged in the new issue and complete new rules for lake freight vessels have been compiled and are published for the first time in the new edition. Mr. Alexander Hynd is the representative on the lakes for the Bureau, to whom all orders for the edition should be sent.

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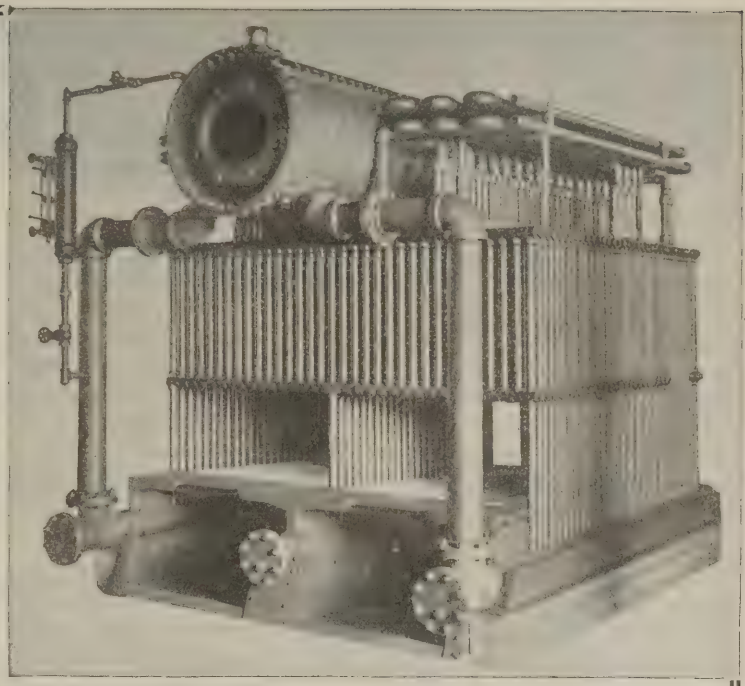

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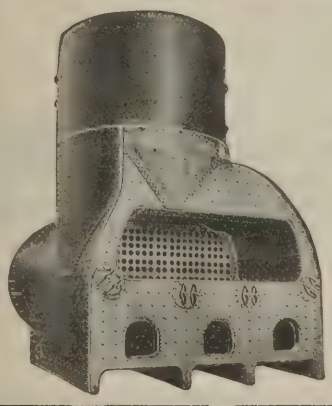

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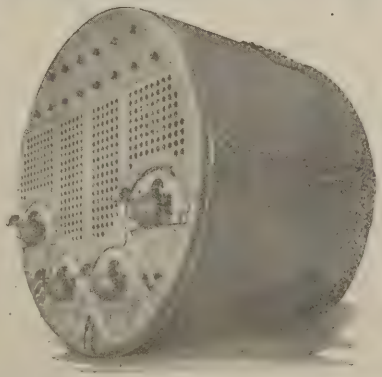

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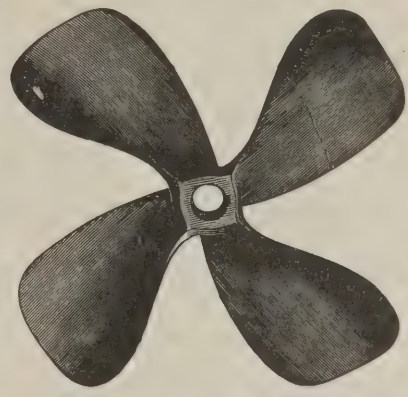

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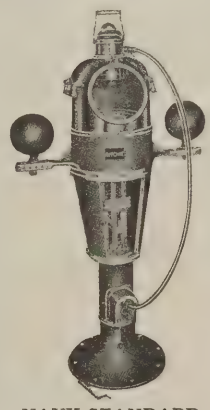

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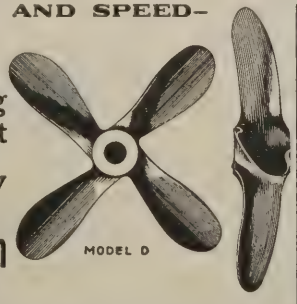

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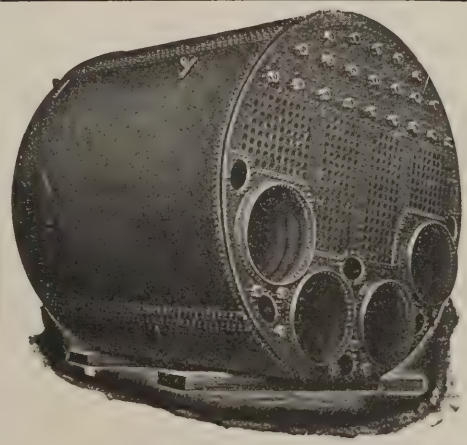

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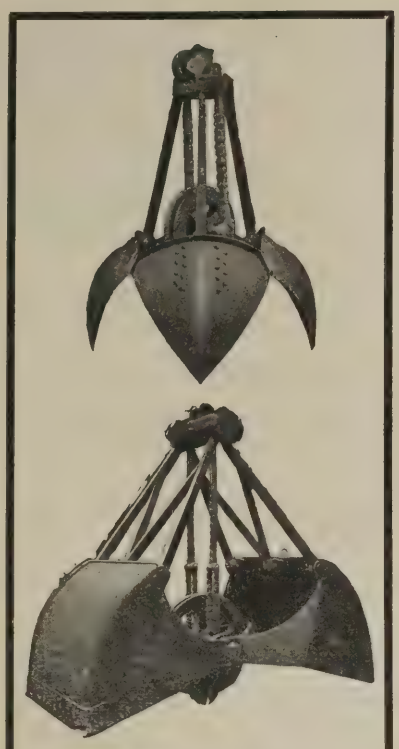

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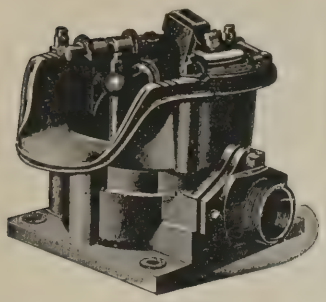

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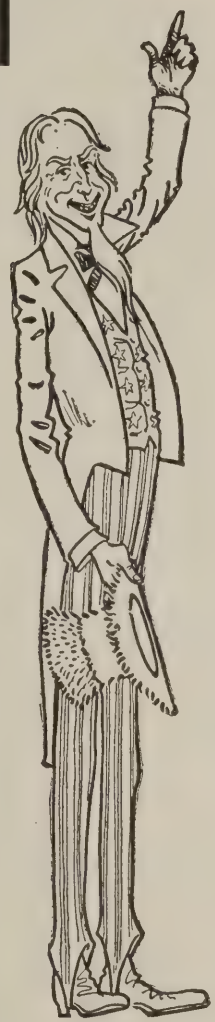

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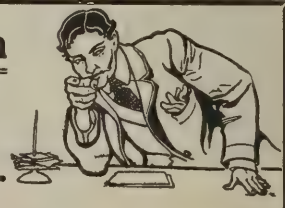

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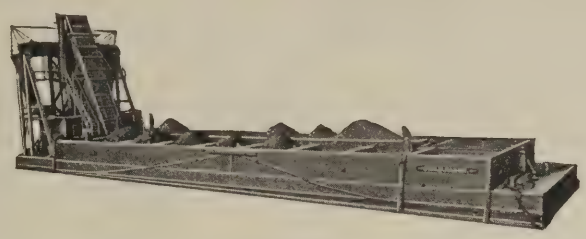

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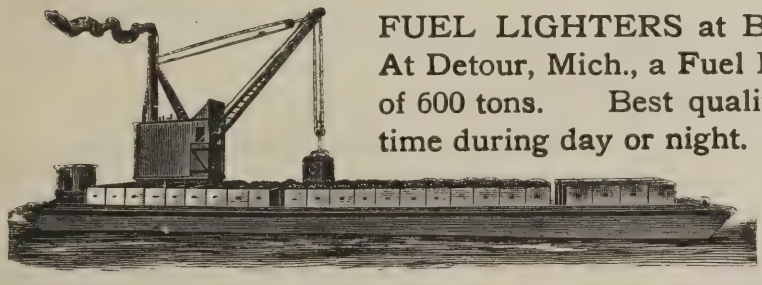

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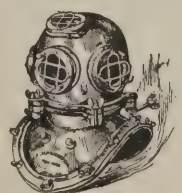

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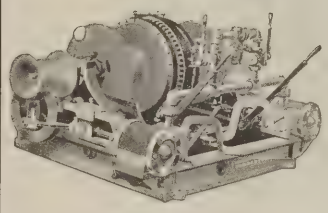

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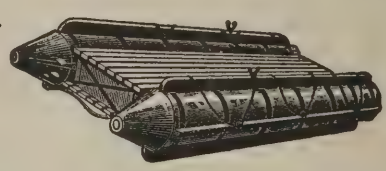

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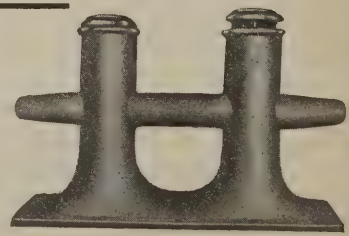

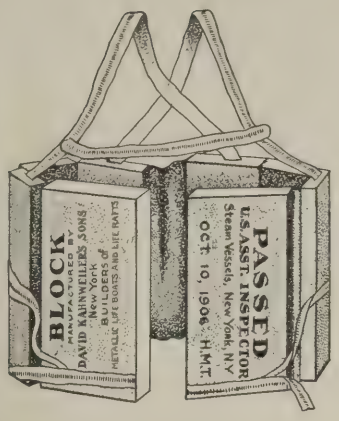

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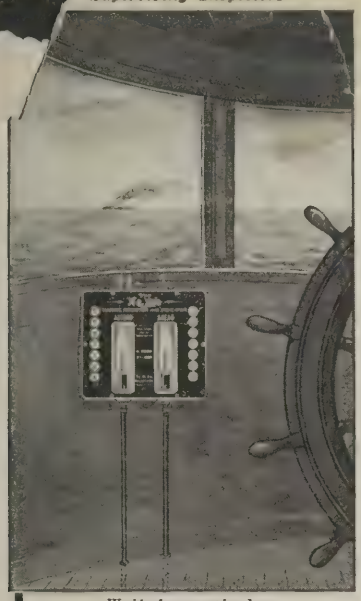

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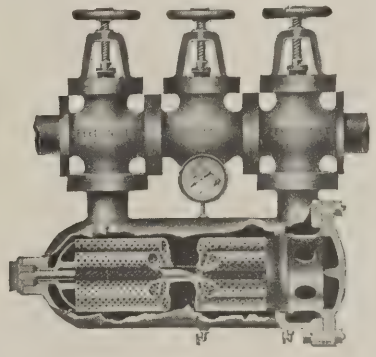

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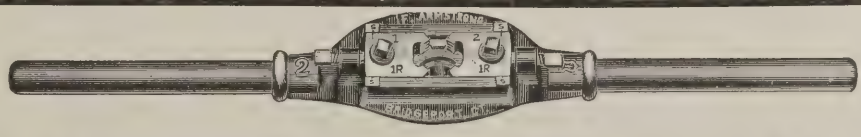

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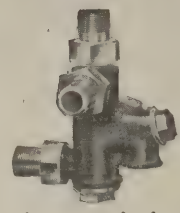

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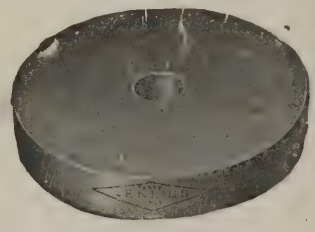

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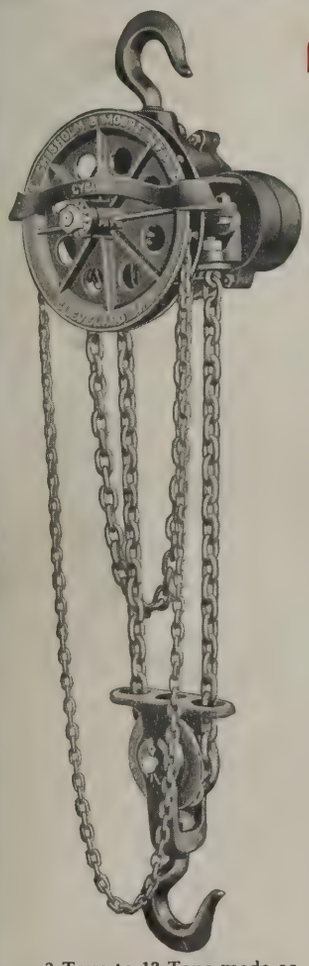

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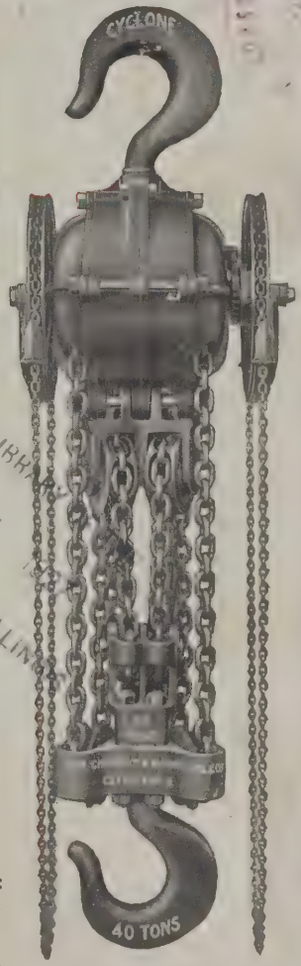

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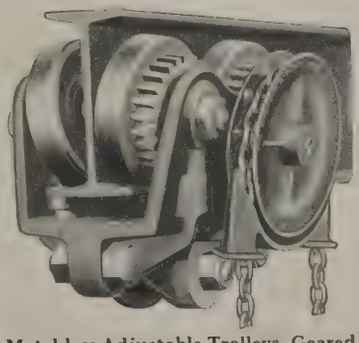

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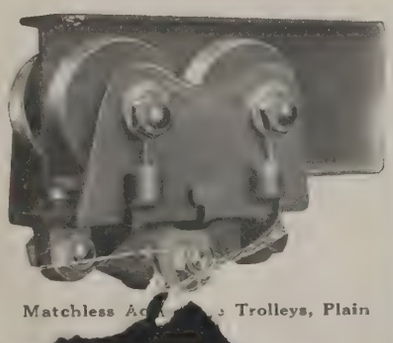

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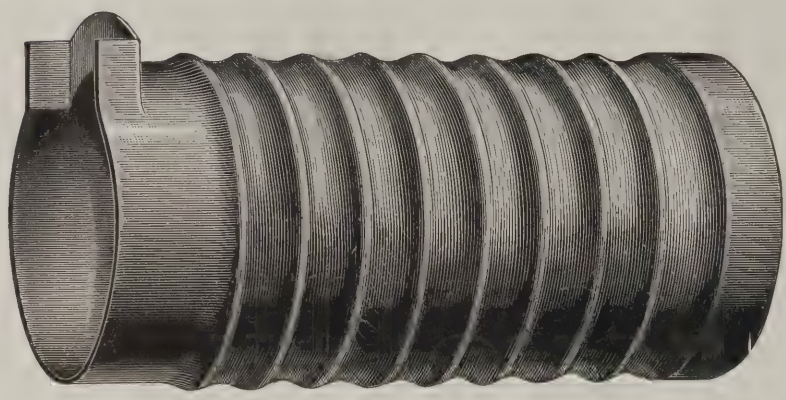

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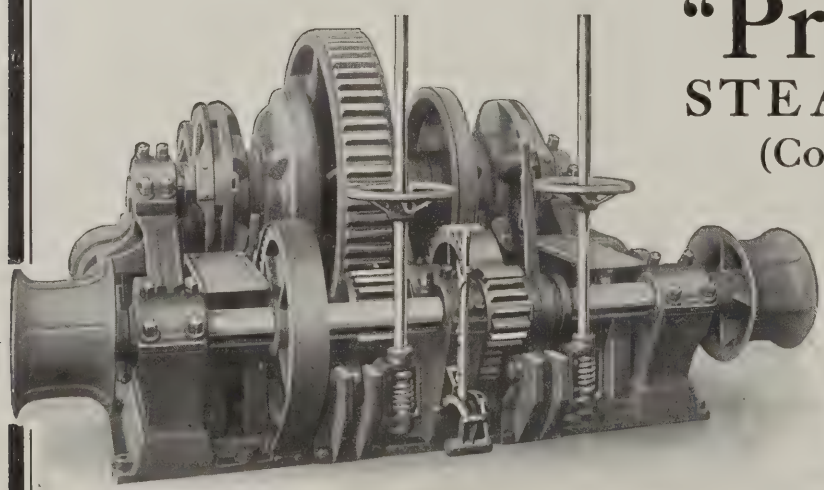

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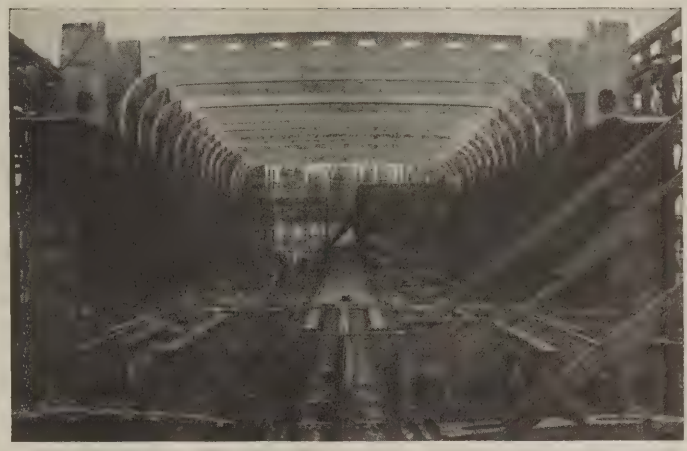

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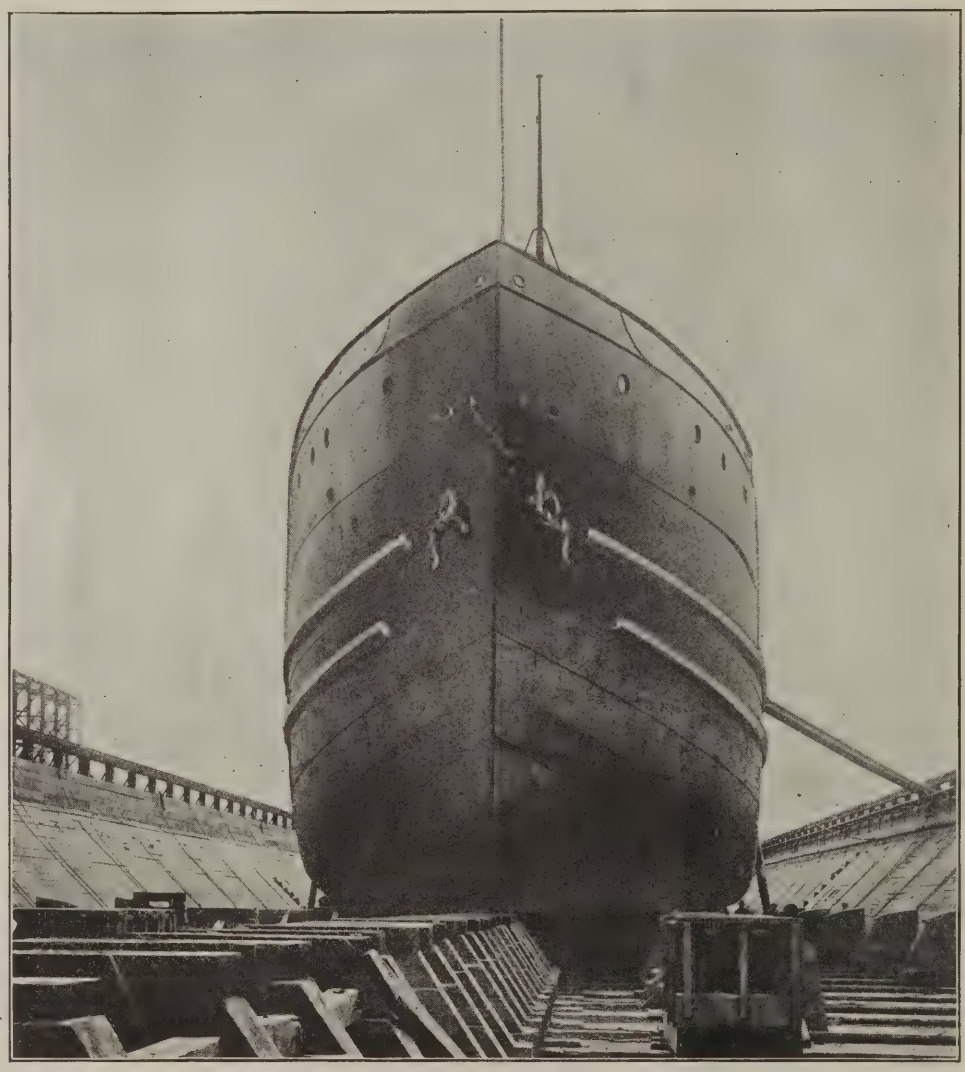

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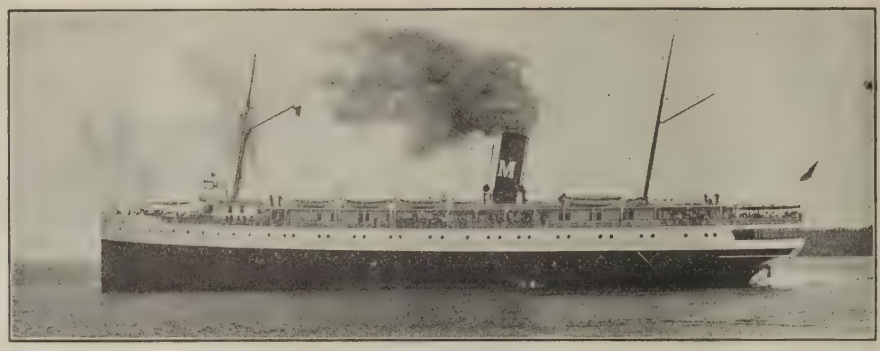

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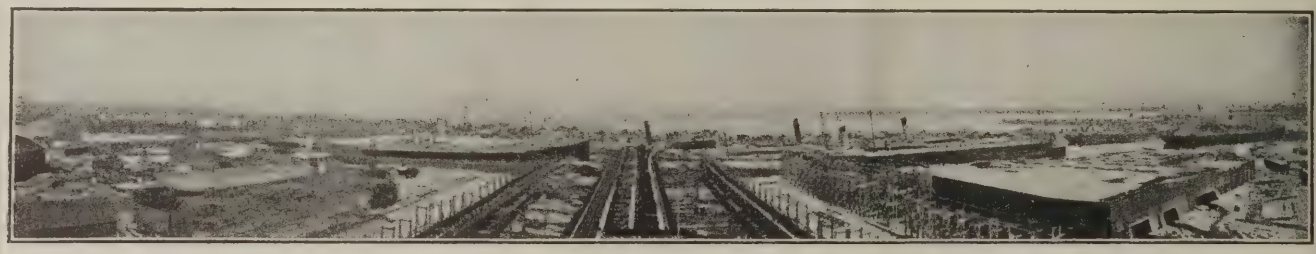

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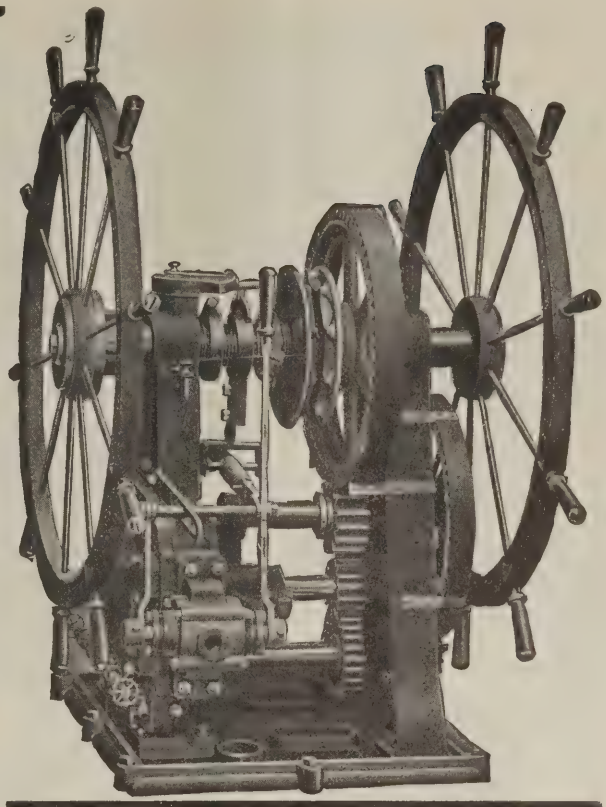

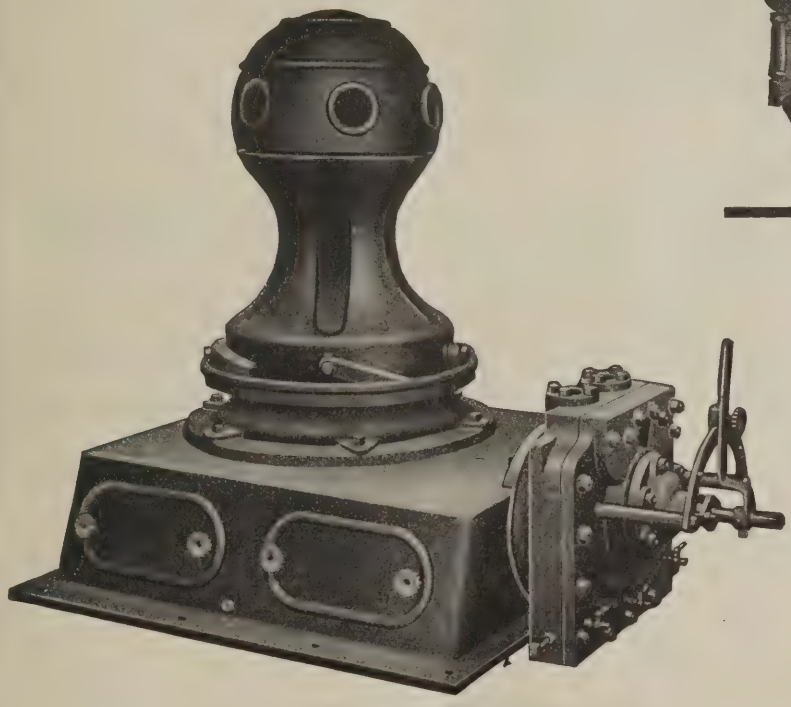

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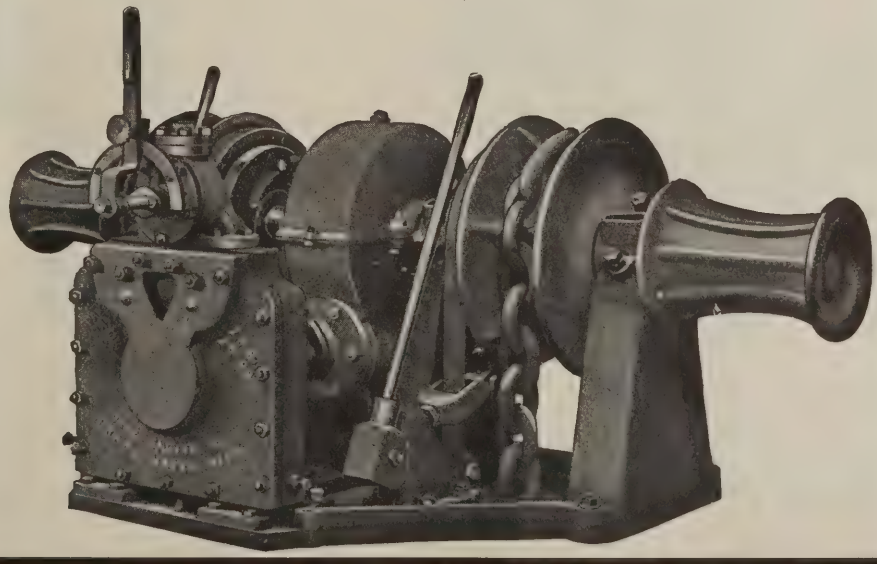

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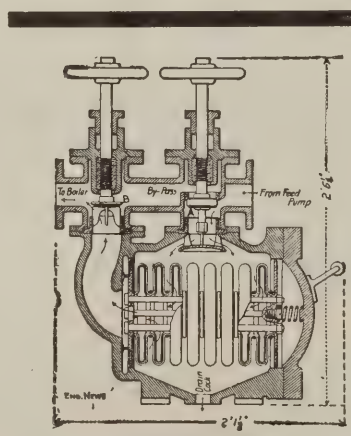

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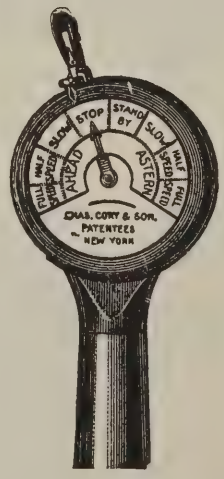

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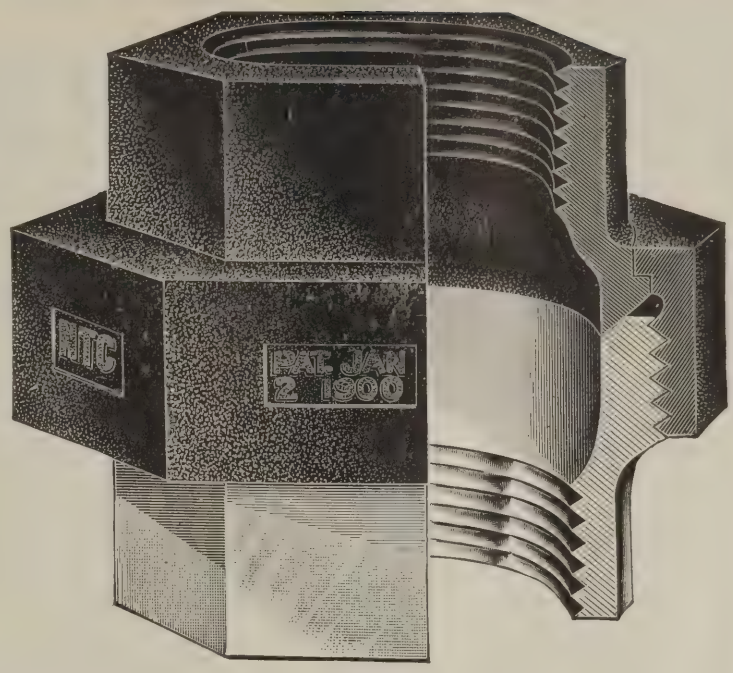

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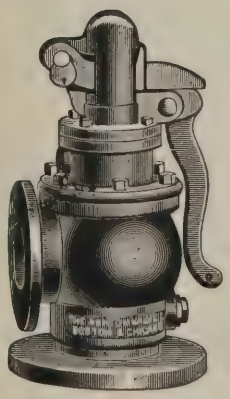

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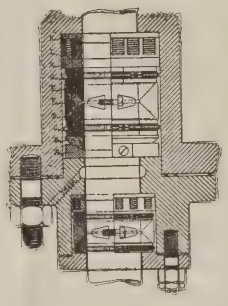

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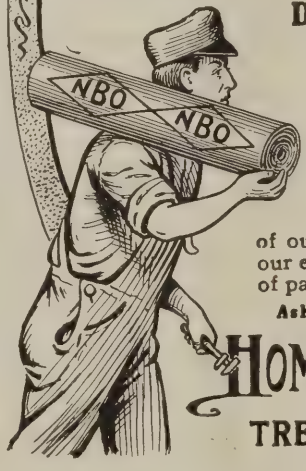

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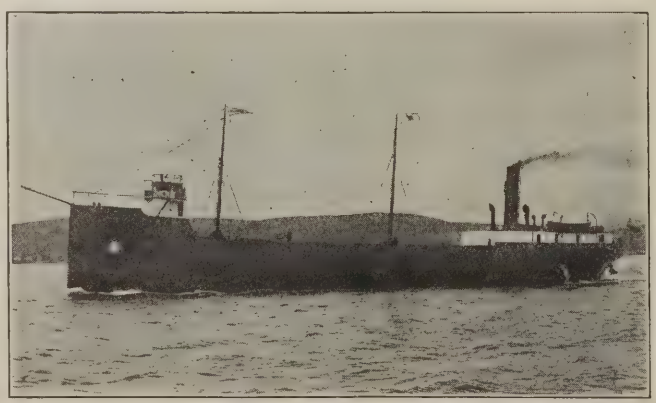

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THE MARINE REVIEW has fortunately come into the possession of a few of the highly prized lithographs of the tug Champion and her tow in the rivers. ¶ In the early 60's 93 per cent of lake tonnage was sail. All iron ore shipments were carried in schooners. The bulk freight steamer as it exists today was unknown. A fleet of tugs was engaged in towing the schooners through the rivers, among them the most powerful and fastest in the world. ¶ This phase of navigation has wholly disappeared but has been most beautifully preserved pictorially in this lithograph of the Champion and her tow, delicately printed in water color pigments. ¶ No collection of lake marine views is complete without this celebrated lithograph.

¶ The nominal sum of $1.50 each, postpaid, has been placed upon the stock remaining.

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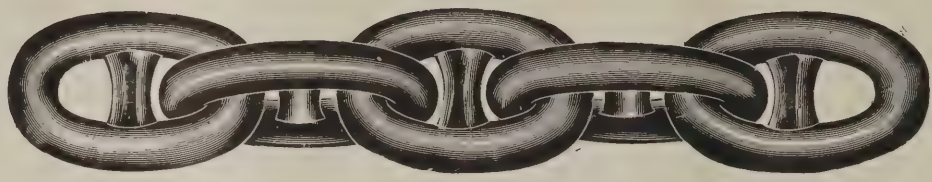

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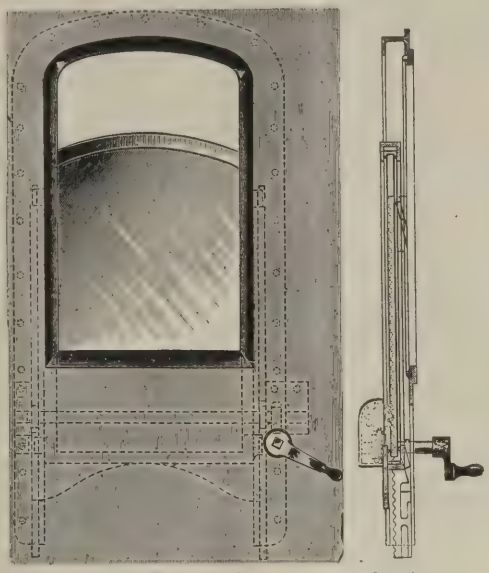

INSIDE VIEW Section

The advantages of this window can be easily seen from the illustrations. It moves vertically and is operated by a single handle, no counterbalance weights being necessary.

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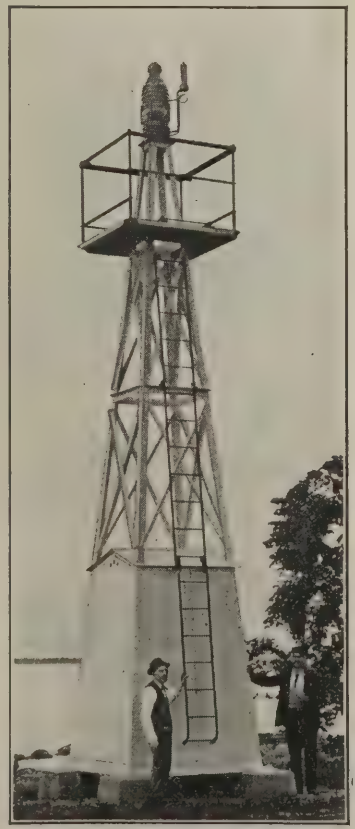

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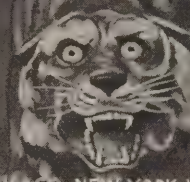

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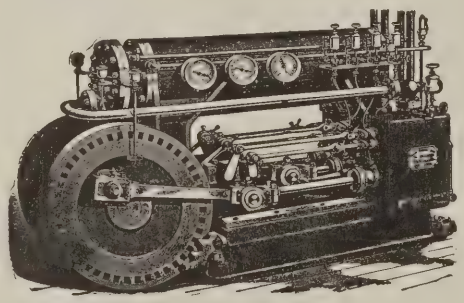

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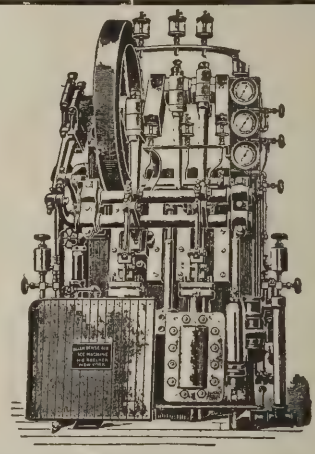

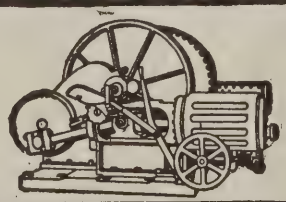

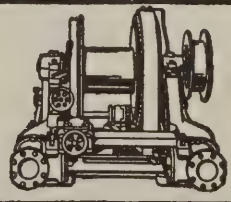

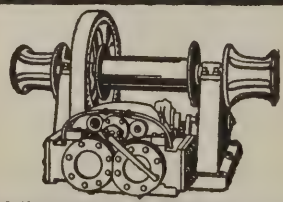

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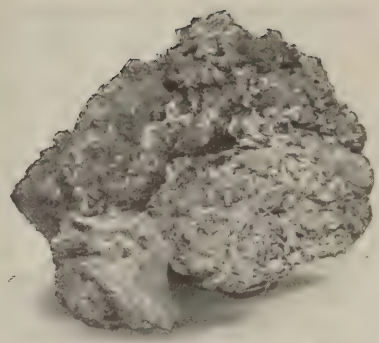
J-M Boiler Preservative Versus Boiler Scale



Boiler Scale

When J-M Boiler Preservative is fed into a boiler it is attracted by the heated steel surfaces.

When water is heated, the scale-forming elements it contains are attracted by the heated steel surfaces.

Two things cannot occupy the same space at the same time.

J-M Boiler Preservative is attracted by the heated surfaces of a boiler *to a much greater degree* than scale or scale forming elements.

It gets *underneath* the scale, next to the boiler, and the scale is thus loosened, drops off, and can be blown or washed out.

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J-M Boiler Preservative is a natural remedy, made from a vegetable (sugar beets), and contains the salts which the beets extracted from the soil, so cannot injure a boiler, fittings, packings or products of a plant.

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A partial view of the substructure of the Ore Unloading dock improvement in Cleveland Harbor. The

5,000 CAST CONCRETE PILES

used on this work were manufactured in our permanent concrete pile plant. Various types and sizes of piles ranging from 1½ to 6 tons in weight, were used to meet the conditions presented.

¶ We also drove these piles and built the entire substructure of this extensive improvement.

¶ We are equipped to cast vertically piles of all practical types, sizes and lengths. A large stock of different lengths always on hand.

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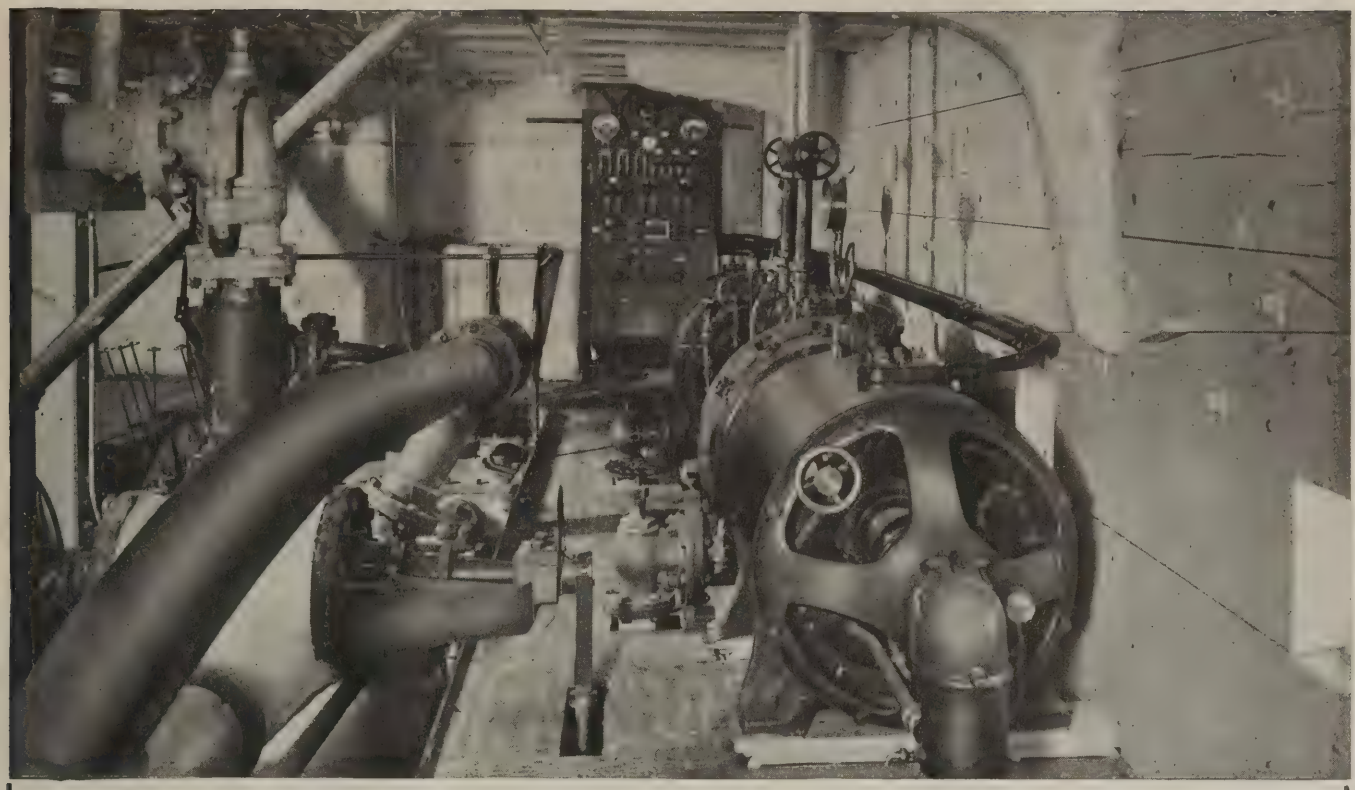

Two 25-kw. G-E Turbines are installed on the new steamer "Thoroughfare" which is used to ferry Southern Pacific trains between Oakland and San Francisco.

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Information on complete electrical equipments, including switchboards, searchlights, lamps, etc., furnished on request.

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JAN 4 1927

THE MARINE REVIEW

VOL. 42 CLEVELAND JULY, 1912 NEW YORK No. 7

Side Wheel Steamer City of Detroit III

CITY OF DETROIT III PASSING SANDWICH IN THE DETROIT RIVER ON HER TRIAL TRIP

Copyrighted, Detroit Publishing Co.

The new steamer City of Detroit III, which went into commission last month between Detroit and Buffalo, is not only the largest sidewheel passenger steamer in the world, but it is unquestionably the finest. It was considered when the City of Cleveland III came out four years ago that the designer and decorator had spent the entire resources of their arts upon her; but in the various forms of comfort, convenience and elegance the City of Detroit III is far superior to her sister. Both the Detroit Ship Building Co. and the Detroit & Cleveland Navigation Co. are certainly to be congratulated upon this latest product. Of course, the Detroit Ship Building Co. has another steamer somewhat larger under way for the Cleveland & Buffalo Transit Co., and it now remains to be seen what profit they can derive from this latest example.

The City of Detroit III went on her owner's trial on June 8. Contrary to the practice of the company, only those directly interested in her machinery and auxiliaries were aboard. The data sheet accompanies this article. The run from Southeast Shoal to Long Point, a distance of 133¼ miles, was made in six hours and 20 minutes, an average of 21.05 miles per hour, the total horsepower developed being 7,606. No data was taken as to the maximum speed as no time was afforded to set the Nicholson log and its diagram was, therefore, misleading. One of the safety valves blew off at 140 lb., and it is clear, therefore, that she can do much better than 21 miles under a full head of steam. On the return trip she was steered with the Akers auxiliary steam steerer, the shift from the regular gear being made in four seconds.

She is considerably larger than the City of Cleveland, as the following particulars show:

City of Detroit III: Length over all, 470 ft.; keel, 455 ft.; breadth, 55 ft. 4 in.; depth, 22 ft.
City of Cleveland III: Length over all, 402 ft.; keel, 390 ft.; beam, 54 ft.; depth, 22 ft.

Her hull is constructed of mild steel with double bottom divided into 11 compartments by watertight crossbulkheads extending from keel to main deck. The bottom is divided at the center line and athwartships into 15 watertight tanks, which can be used to vary trim and draught by means of water ballast, for the control of which powerful pumps are fitted. There are two decks below the main deck and three above. A steel superstructure is carried to the main deck, though the ceiling of the saloon deck is sheathed with galvanized iron, practically making her entire housing up to the saloon deck fireproof. A steadying tank of 100 tons capacity is provided amidships to check rolling in a heavy sea.

GOTHIC ROOM CITY OF DETROIT III

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Everything that ingenuity can suggest for the safety and convenience of passengers is incorporated in the City of Detroit III. Passengers will appreciate the running hot and cold water which is supplied to every stateroom and throughout all parts of the ship. An automatic fire alarm reaches all departments. This alarm or thermostat consists of a small hollow copper wire which is connected with a sensitive diaphragm or plate, the latter sounding the alarm. The wire is installed in staterooms and other sections of the steamer in such a manner that it is exposed so that a certain degree of heat causes it at once to sound an alarm. The wire is so small that it can be placed over molding and around fancy scroll work such as is in the staterooms. The entire boat is divided into sections, eight staterooms to a section, under the plan of the new system, and when the alarm of fire is sounded an indicator or annunciator shows in what section of the boat the fire is. The wire is sensitive only to heat registering 140 degrees or more and even becomes susceptible to the heat of a burning newspaper held near it. In addition, fire walls have been installed by which, in case of fire, sliding asbestos-faced doors are shoved out, confining the fire to that particular portion of the boat. The steamer is additionally protected from fire by a complete sprinkler system, leading to the freight deck, main saloon and wing passages, the water being supplied by an 8-in. Worthington centrifugal pump driven by a 100 H. P. Terry turbine.

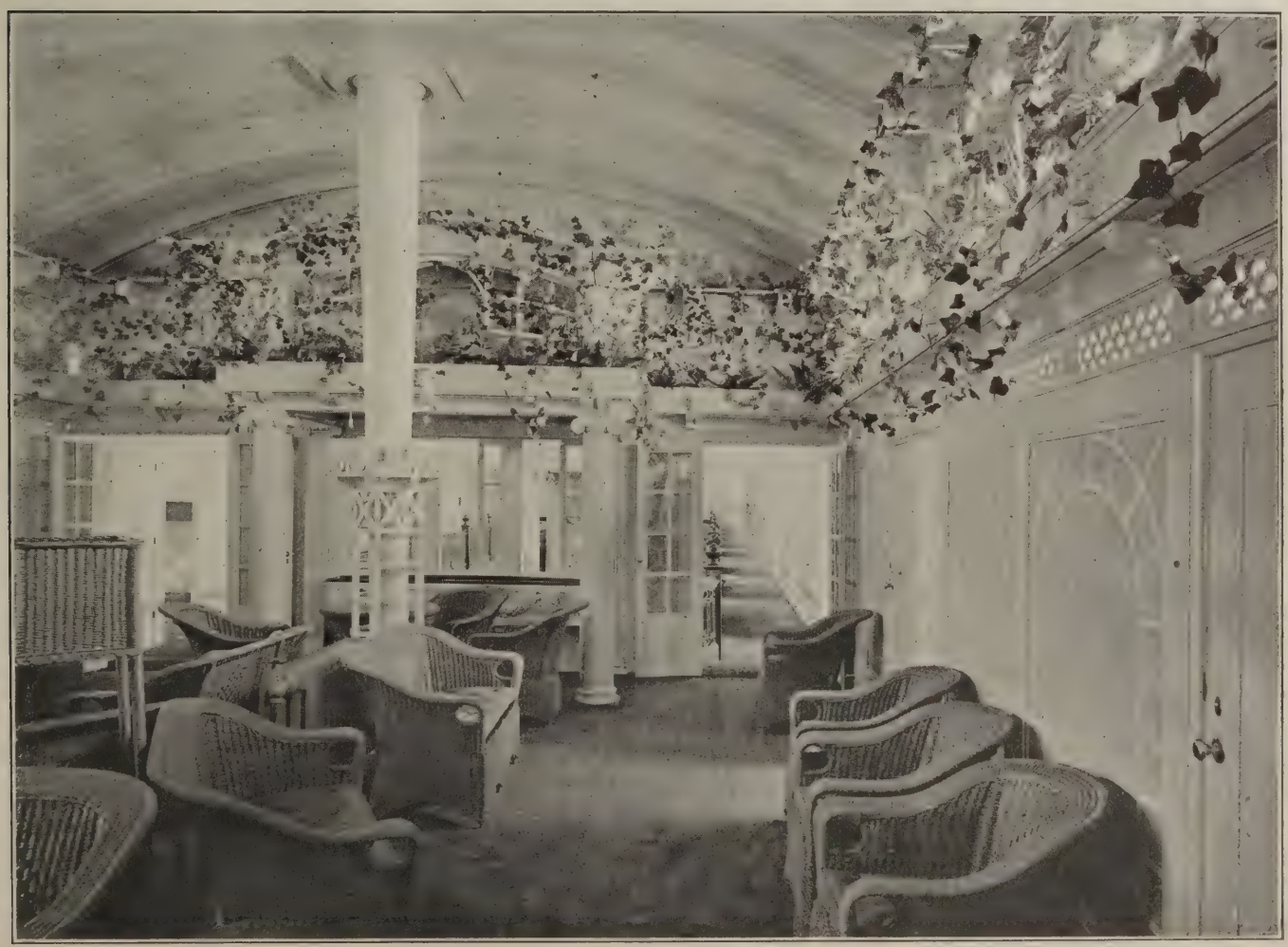
There are four sets of McCreery Engineering Co.'s air washers which furnish washed air to the inside staterooms, making them as comfortable and desirable as outside staterooms, as well as furnishing it to the crew's living spaces and the galley.

The Propelling Machinery

The propelling engine is of the inclined, three-cylinder, compound jet condensing type, having one high pressure and two low-pressure cylinders. In design it is exactly similar to the engine of the City of Cleveland, which has given such eminent satisfaction for the past five seasons, but is enlarged slightly to give the increased horsepower required. The estimated I. H. P. is 8,000 at 30 r. p. m. The high pressure cylinder is 62 in. in diameter and is placed between the two 92-in. diameter low-pressure cylinders, all having a common piston stroke of 8 ft. 6 in. The high-pressure cylinder is fitted with poppet valves and Seckles cut-off gear, while the low-pressure cylinders have Corliss valve and gear. All the valves are operated by ordinary double bar Stevenson link motion and the cut-off in each cylinder has a range of from one-fourth to three-fourths of the stroke, adjustable from the starting platform.

None of the cylinders are steam jacketed but, together with the two large tank receivers, are well insulated. The pistons are of cast steel, conical and of single thickness and are fitted with cast iron spring and junk rings. The piston rods, cross-heads, connecting rods, guide struts and crank shaft are all of the highest quality steel forgings, supplied by the Midvale Steel Co. The crank shaft is 25 in. in diameter in the engine bearings and 27½ in. diameter at the outer bearings, 71½ ft. long from end to end and weights 103½

La Salle Window in Gothic Room of City of Detroit III.



Palm Court, Forward, City of Detroit III

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STAIRWAY LEADING TO GALLERY DECK, FORWARD, CITY OF DETROIT III

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tons. It is made in three sections connected by flanged couplings which are recessed into the hubs of the crank arms. The crank arms are sunk into the pins, thus making the crank shaft perfectly rigid from end to end and avoiding all the trouble incidental to loose pins, wedges, etc. The crank shafting and pins are hollow throughout.

The connecting rods are 20 ft. center to center and 13½ in. diameter at the center of their length. The crank pin end is fitted with round brasses lined with white metal, the caps being forged steel worked out of the main forging. The crosshead end is forked and fitted with flat-bottomed brasses and wrought steel caps and bolts. Each connecting rod weighs approximately 10 tons. The piston rods are 12 in. diameter and the crosshead slippers are steel castings faced with white metal. The main bearing pedestals, six in number, are massive steel castings, rigidly bolted to the foundations, which are part of the ship structure, and braced together to insure stiffness when the engine is working. The caps are steel castings, box section, the bearings being circular shells lined with white metal. The guide struts are connected to the main bearing castings by a T-end through which the main bearing bolts are extended, and to the cylinder by round flanges and bolts. Midway in their length they are supported by vertical columns carried from the ship's floors. Each cylinder is cast complete with its valve chests, thus avoiding all unnecessary and oftentimes troublesome joints. The front heads are also cast with the cylinders and are strongly ribbed to distribute the strain from the guide struts. The finished low-pressure cylinders weigh approximately 27¾ tons each and are excellent specimens of the founders' art.

The main air pumps, two in number, are of the vertical, single-acting plunger and bucket type, driven through heavy forged steel bell crank levers, from the low-pressure crossheads. Each air pump crosshead also carries the plunger of a single-acting vertical feed and bilge pump.

The condensers are built up of riveted plate and each low-pressure cylinder connects with its own condenser through a 24-in. exhaust pipe.

The reversing of the engines is accomplished by means of a direct-acting steam gear, but a powerful hand-operated worm reversing gear is fitted for emergency use.

The handling gear levers are all conveniently grouped in a quadrant on the working platform above the cylinders and, massive though the moving parts are, the reversing, etc., is accomplished with the greatest ease and facility. The main throttle valve, 17 in. in diameter, is of the Schuette-Korting balanced type, operated by a simple lever and is fitted with an 8-in. "by-pass" or maneuvering valve which is sufficiently large to operate the engine up to half speed. The lubricating system is elaborate and complete, as are the appliances to assist in the overhauling or lifting of the engine parts. The paddle wheels are unusually strong and heavy and are designed to successfully meet the severe ice conditions met with in the early part of the season. The centers are of cast steel and the arms of forged iron with the large gudgeon bosses forged on and bushed with lignum-vitae. The wheels are 30 ft. 3 in. outside

GRAND SALON, LOOKING AFT, CITY OF DETROIT III

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diameter, each fitted with 11 curved steel buckets 14 ft. 6 in. long by 5 ft. wide. The radius rods are of forged steel fitted with brass bushings. The outboard bearings are heavy steel castings, lined with white metal, and are adjustable in vertical and fore and aft directions.

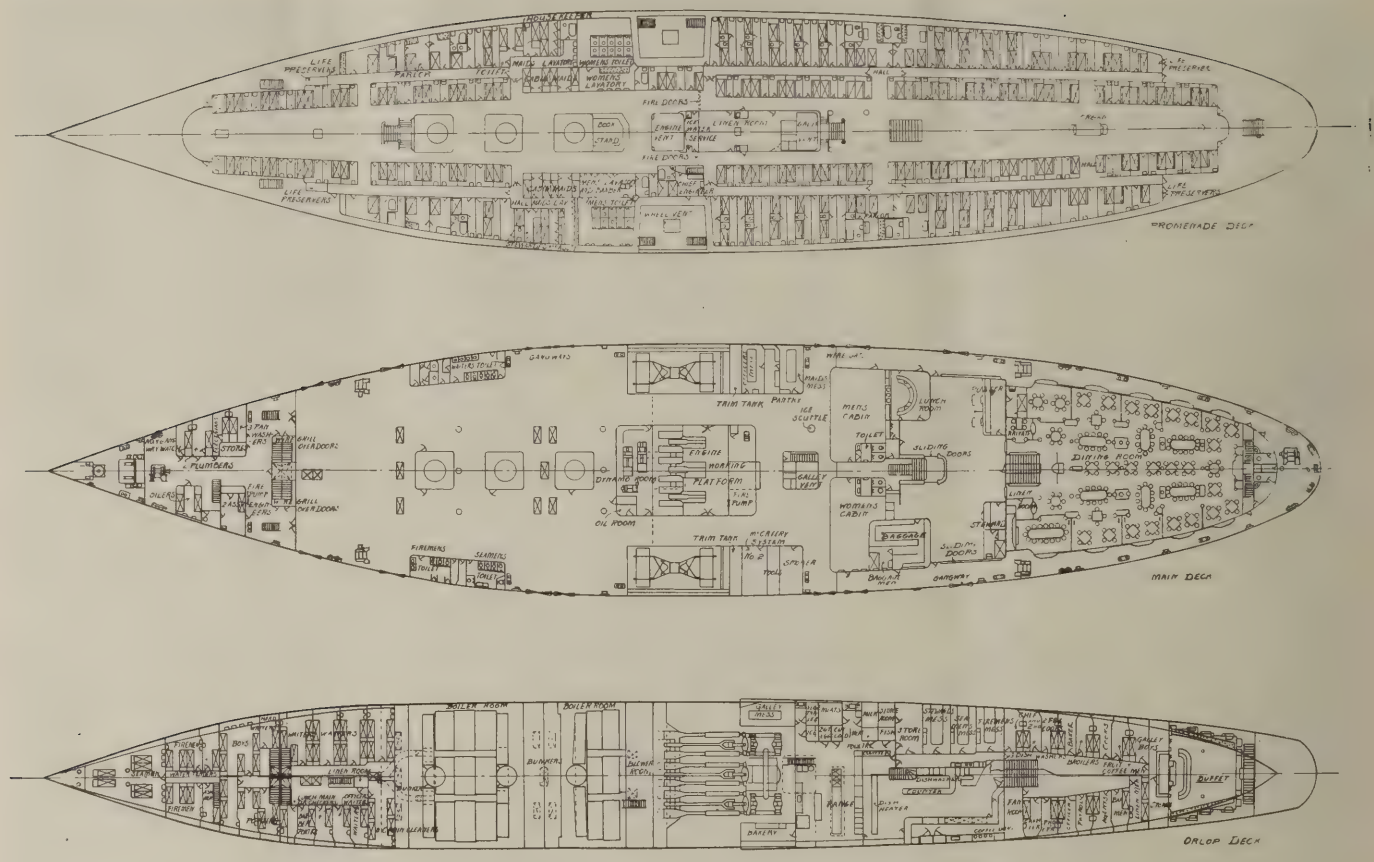
Steam at 160 lb. per sq. in. pressure is supplied by six cylindrical return-tube boilers of the following dimensions: One single-ended, 13 ft. 9 in. diameter by 12 ft. long, with two 52-in. diameter Mouson furnaces; one double-ended, 13 ft. 9 in. diameter by 22 ft. long, with four 52-in. diameter Mouson furnaces; two single-ended, 14 ft. 8 in. diameter by 12 ft. long, with three 44-in. diameter Mouson furnaces; two double-ended, 14 ft. 8 in. diameter by 22 ft. long, with six 44-in. diameter Mouson furnaces, making six 52-in. diameter, and 18 44-in. diameter furnaces, or 24 in all. The grates are all 5 ft. 6 in. long and the boiler tubes are 24 external diameter. The boilers are placed in two batteries of three each, and are fired in a fore and aft direction, the coal being carried in three athwartship bunkers. The Howden system of heated air forced draft

TRIAL TRIP OF CITY OF DETROIT III.

Hull.—Length, keel, 455 ft.; overall, 470 ft.; breadth, 55 ft. 4 in.; depth, 22 ft.
Engine.—Inclined, three-cylinder compound, 64 in., 92 in. x 8 ft. 6 in. stroke.
Boilers.—One single end, 13 ft. 9 in. x 12 ft.; two 52-in. furnaces.
Two single end, 14 ft. 8 in. x 12 ft.; three 44-in. furnaces.
One double end, 13 ft. 9 in. x 22 ft. 7½ in.; four 52 in. furnaces.
Two double end, 14 ft. 8 in. x 22 ft. 7½ in.; six 44 in. furnaces.
Working pressure, 160 lbs. All grates 5 ft. 6 in. long.
Total grate surface, 506 sq. ft. Ratio 47.68.
Total heating surface, 23,673 sq. ft. Ratio 47.68.
Howden draft; three No. 9 Sirocco blowers direct connected to double 7 in. x 7 in. engines.
Heater.—One Schuette & Koerting film type.
Feed Pumps.—Two 7 in. x 39 in. connected to main engine.
One Blake compound simplex, 14 in., 24 in., 13 in. x 24 in.
Wheels.—30 ft. 3 in. diameter over buckets.
11 buckets, 5 ft. wide, 14 ft. 6 in. long.
Draft of Water.—Mean, 13 ft. 1½ in. Displacement, 6,370 net tons.
Endurance run from S. E. Shoals to Long Point, distance 133¼ miles. Time, 6 hours, 20 minutes.

Steam pressure, average, pounds	134.2
Receiver, average, pounds	30.17
Vacuum, port condenser, average, pounds	24.35
Vacuum, starboard condenser, pounds	24.85
Revolutions	28.25
I. H. P., H. P. cylinder	2,284.77
I. H. P., S. L. P. cylinder	2,757.37
I. H. P., P. L. P. cylinder	2,563.87
Total	7,606.01
M. E. P. reff. to one 130.1 in. L. P. cylinder, pounds	38.36
Ratio, I. H. P. ÷ grate surface	15
Ratio, heating surface ÷ I. H. P.	3.11
Temperature of sea, average, degrees	56
Temperature of hot well, average, degrees	124
Temperature of feed, average, degrees	126
Temperature of air at fan, average, degrees	95
Temperature of air in ash pit, average, degrees	252
Air pressure at blower, average, inches	4.8
Air pressure of ashpit, average, inches	.96
Speed of ship (18.27 knots), average, miles	21.05
Speed of wheels, miles	30.5
Slip of wheels, per cent	30.9

$$C = \frac{D^{\frac{2}{3}} \times S^3}{\text{I. H. P.}} = \frac{5{,}687\frac{2}{3} \times 18.27^3}{7{,}606} = 255.$$



PROMENADE, MAIN AND ORLOP DECKS OF CITY OF DETROIT III

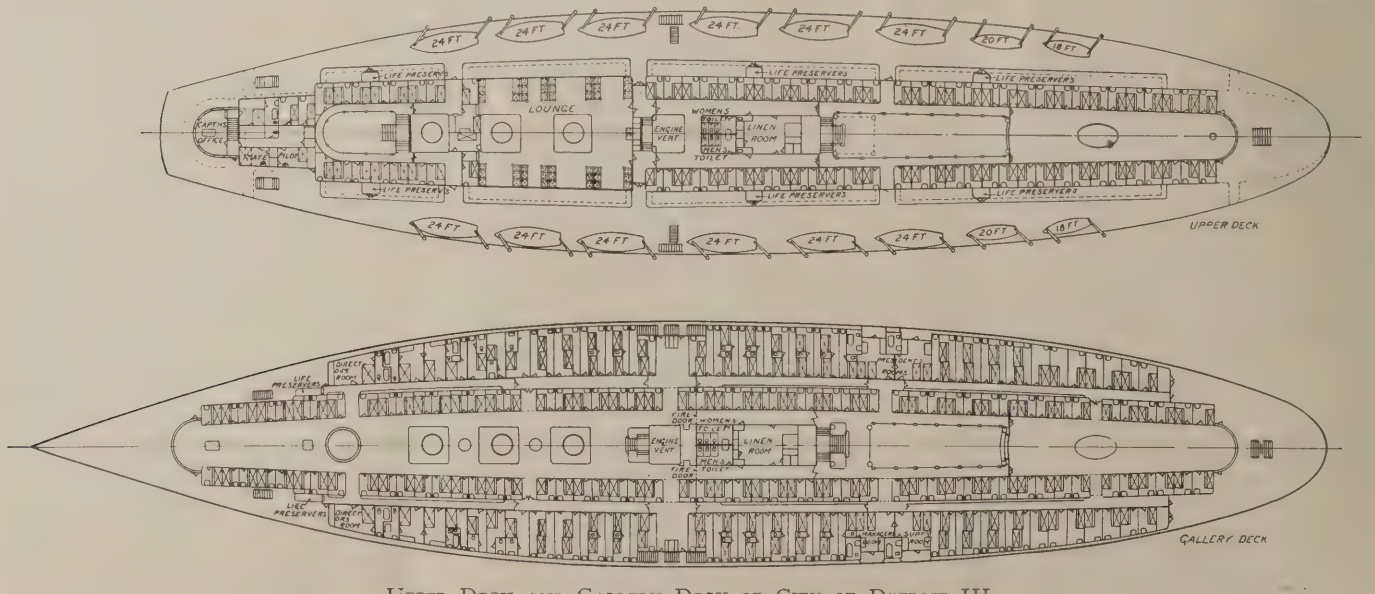
is fitted, the air being supplied by three Sirocco fans direct driven by vertical American Blower Co. engines. There are three funnels with outer casings fitted up to the level of the top deck and single above.

The ashes are discharged overboard and well clear of the ship by means of six double jet ash ejectors, two in each stokehold. The stokeholds are well ventilated and are remarkably cool even when steaming at full power.

There are 600 staterooms, 25 parlors with bath and private verandas, 50 semi-parlors with private toilets; all staterooms have telephone with shore connections when in port. The parlors are finished in poplar and hardwood and have a chiffonier, settee, thermos bottle for hot and cold water; electric fans and other conveniences built in place; each contains a large mirror and light floral paintings adorn the decorative panels. All berths in staterooms and beds in parlors are fitted with the Marshall ventilated diameters.

The lobby on the main deck is of the Doric order of architecture, finished in bold figured selected mahogany inlaid with marquetry with scagliola columns, having carved capitals with brass bases. The ceiling panels are in composition relief finished in gold. Ceiling and wall fixtures are finished in burnished antique gold, windows and doors glazed with plate and opalescent glass and the floor of interlocking rubber tiling.

The dining room, located on the main deck aft, follows the



UPPER DECK AND GALLERY DECK OF CITY OF DETROIT III

IRVING R. BACON'S MURAL PAINTING, "THE LITTLE OLD MAN OF THE WOODS", ON STEAMER CITY OF DETROIT III

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colonial in design. The wainscoting is of mahogany, ceiling panels of canvas suitably decorated. Travelers will undoubtedly appreciate the location of the dining room, as, extending the full width of the ship, it gives an unobstructed view of the sea as well as affording perfect ventilation. Ordinarily the dining rooms of side-wheelers are below the main deck where the view is confined to the splash from the wheel buckets against the portholes. In addition to the general dining room there are a number of private dining rooms finished throughout in mahogany.

The buffet, located directly beneath the dining room, is reached by a stairway finished in bold figured white oak with brass hand railings and fittings. The buffet is designed after the plan of an old wine cellar, with vaulted ceilings between the columns, the plaster being tooled to represent huge blocks of stone masonry. The floor is of tile and all woodwork of white oak, including the furnishings. Striking features of the room are paneled hogsheads with iron bands above the settees on either side of the room. The heads of the hogsheads are decorated with burnt work in colors. The electric fixtures are in the form of old hammered brass lanterns.

The main saloon and forward saloon on promenade deck are finished in selected mahogany with marquetry inlaid work, and the upper and gallery decks in poplar paneling. Impressive features of the decorate scheme are four large mural paintings in the ceiling of the after saloon and three in the ceiling of the saloon forward; there are two large panels at the stair landings forward and aft and three lunette panels in the dome.

The palm court is located aft on the upper deck, with pergola and bay window forward, fountain with running water and trellis screen aft; columns, cornices, flower boxes and stands lend to this place an attractiveness enhanced by the decorative scheme, and finishings that make it one of the most popular places on the ship.

The Marie Antoinette drawing-room is on the gallery deck aft, directly beneath the palm court. This is finished in poplar with paneled ceilings, ornamental cornices, columns and stringers, the panels of walls and ceilings being decorated in a light floral design of the Marie Antoinette period and the furnishings designed to harmonize.

The Gothic room on the upper deck at the stacks, is of Gothic design worked out in English oak; decorative features include carved capitals and arches, brackets, lanterns, electroliers and a mantel complete with fireplace, andirons and electric heating apparatus. Spacious settees and upholstered chairs make this a most inviting place. There are also five Tiffany stained glass panels in heraldic design. This room also contains a pipe organ and it has been reliably stated that the Mauretania does not possess any feature that surpasses the design of this room.

Reference to the illustrations will show with what care the decorative features have been worked out. It is well known that the Detroit & Cleveland has selected the frog as its

DIRECTORS' STATEROOM CITY OF DETROIT III

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emblem and Irving R. Bacon, the noted artist, has worked the harbinger of spring into a very effective mural painting under the title "The Little Old Man of the Woods."

The electrical equipment of the City of Detroit III consists of two 75 K. W. Kerr turbine-driven Northern generators working at 1,800 revolutions, 110 to 120 volts; also one 35 K. W. machine of the same working at 3,600 revolutions. The two 75 K. W. machines exhaust into a Dean jet condenser with 10 x 18 x 18 air pump.

There is a Blake vertical duplex compound ballast pump, 15 x 24 x 18, pumping from the water bottom and discharging overboard or to the trimming tanks, at will.

The sanitary pump is also a Blake duplex compound 8 x 14 x 12, supplying water to the toilet rooms; also cooling water for the main engine.

The fresh water pump is a Blake duplex, 8 x 10 x 12, drawing water for four fresh water tanks of a combined capacity of 17,000 gallons. The water for drinking purposes is all purified by an electrical apparatus furnished by the Water Purifying Machine Co., of Buffalo, N. Y.

The refrigerators and food storage spaces are cooled by an 8-ton carbonic anhydride refrigerating machine built by Kroeschell Bros., of Chicago. The feed water to the boilers is heated in a Schuette & Koerting spiral film feed heater of 162,000 lb. capacity at 200 deg. with 4 lb. back pressure.

In addition to the sprinkler pump for fire purposes, there is also a Blake Underwriter's pump, 16 x 9 x 12, also an auxiliary feed pump, Blake duplex, 14 x 7½ x 12.

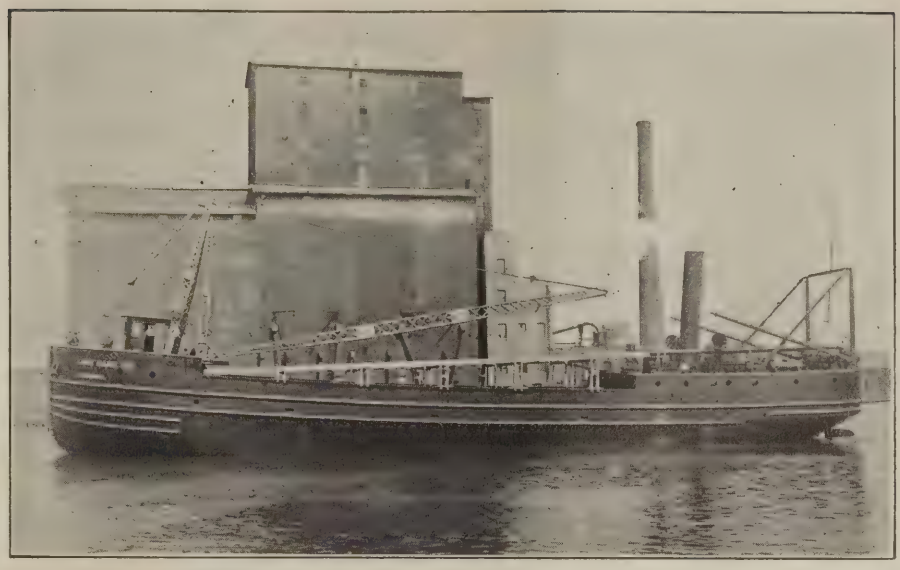
The new steamer is also fitted with a Schuette recording compass which has met with such success on both lakes and ocean during the past few years.

New Sand Barge for Lake Michigan

The steamer Elias Gunnell is the latest addition to the fleet of sand suckers belonging to the Lake Sand Co., of Chicago, and operated out of that port. This vessel is the third designed and built for the same owners by the Manitowoc Ship Building & Dry Dock Co., of Manitowoc, Wis., and was delivered to the owners, June 29.

The new vessel is 170 ft. long over all, 36 ft. beam and 10 ft. deep, and has a carrying capacity of 700 cu. yds. of sand in the hopper on deck.

The hopper is built as part of the hull, the regular side frames extending to top of the walls, and plated in the same way as the main hull.



SAND SUCKER E. GUNNELL
BUILT BY MANITOWOC SHIP BUILDING & DRY DOCK CO.

There are five watertight athwartship bulkheads in the hull and a fore and aft bulkhead extending from the collision bulkhead aft to boiler room. The hull is therefore divided into nine watertight compartments, supplemented by a small watertight flat around the stern tube. Every compartment has separate bilge piping so that the water ballast may be carried in any or all the compartments.

The after deckhouse is carried out flush with the sides and end of the boat, built of steel throughout and forms an integral part of the hull. This deckhouse contains the boiler room, engine room, pump room and living quarters. There are four large comfortable crew rooms in this space besides the galley and dining room. All finished in southern pine and varnished.

The two 12-in. sand pumps are located on fan tail and over these are the derricks for handling the suction hose. These derricks are operated by a deck winch on the spar deck.

The forecastle on the main deck contains a large room for the captain and two rooms for the crew. Situated in this space also are the large hoisting and swinging engines for the operation of the unloading derrick. This derrick, which is built of steel throughout, unloads by means of a clam shell bucket.

On the forward spar deck is placed the pilot house which contains a steam stearing gear and a steam windlass to handle the two stockless anchors.

The propelling machinery consists of a 16 and 34 x 26-in. fore and aft compound engine with a jet condenser. The engine swings an 8-ft. wheel and develops 400 H. P. A bilge pump with an 8-in. suction is connected to the bilge pipe and sea cocks. The boiler is a Scotch marine type with steam drum and is 12 ft. 6 in. in diameter and 13 ft. long, carrying 160 lb. of steam. The Gunnell with a full load makes a speed of 11 miles per hour, and her regular run is between Chicago and Michigan City, Ind.

The sand suckers, of which the Gunnell is the largest, operate during a season of 10 to 11 months a year, and the winter months at the southern end of Lake Michigan are an excellent test of the seaworthy qualities and general reliability of these boats. By means of freeing ports in each pocket the vessel may be lightered of her load in case of necessity in the short space of five minutes.

The Toiler, which was brought over from Great Britain last year and which is equipped with Diesel engines, has been sold to a syndicate of which James Playfair, of Midland, H. W. Richardson, of Kingston, and H. H. Gildersleeve, of Sarnia, are principally interested. She will be operated under the management of J. Richardson & Sons, of Kingston, and will trade almost exclusively between Montreal and Port Colborne.

The New England Steamship Co., of New Haven, which is controlled by the New York, New Haven & Hartford Railroad Co., has increased its capital stock from $250,000 to $6,000,000.

Dry Dock New York Navy Yard

After Many Years of Effort and Two Adandonments of Contract Dry Dock No. 4 is Finally Completed—Description of the Great Structure

When, on May 9, 1912, the Utah, the latest and largest of our American battleships, was towed into the barely completed dry dock No. 4, at the Brooklyn navy yard, the final test of a long and in many ways novel engineering work was accomplished. The dock has been a construction problem of marked difficulty. Many novel expedients were called for and developed in the work, and it may be said that ordinary methods of construction were conspicuously absent.

As early as 1900 the necessity for increasing the sizes and modifying the type of graving dock to meet the development in the size and character of fighting vessels was realized. On June 7 of that year, congress appropriated $1,000,000 for the purpose of constructing at the New York yard a dry dock of granite and concrete. Plans were made and bids asked, but it was not until Feb. 7, 1905, that a contract was entered into by the navy department with Geo. B. Spearin for the construction of the dock. As contracted for, the dock was to be 554 ft. long. The maximum ship provided for by the dock was 506 ft. long and 91 ft. beam. The method adopted was to make an open excavation within a cofferdam of steel sheet piling, and construct the entire dock in this open cut. The sheet piling was driven in, however, by the surrounding soil, and having no firm foundation, offered no effective resistance. The movement finally produced marked settlement in surrounding territory, damaging several nearby buildings and breaking a large Brooklyn city sewer which traversed the site of the dock, flooding the work. Added to this, the quicksand located a short distance below the surface, was impossible to handle, and Spearin finally abandoned the work.

On April 14, 1908, the contract was re-let to the Williams Engineering Co. The size of the dock under the contract was increased to 620 ft. over all, which provided for a ship 525 ft. long. The Williams company practically repeated history; although they added somewhat to the total amount of excavation and actually succeeded in placing about 10,000 yards of concrete in sheeted trenches, the over-

FIG. 2.—SHOWING THE CAISSON GATE FLOATING INTO POSITION BEHIND THE UTAH

hang still closed in and the sands boiled. The work was again abandoned and the contract cancelled.

An unusual step was now taken by the navy department. Five construction companies of the requisite financial strength were invited to bid for the completion of the dock. The Holbrook, Cabot & Rollins Corporation, of Boston, was the low bidder, at $1,389,000, and contract was made with them on Nov. 13, 1909. Almost coincident with this, Civil Engineer Frederic R. Harris, United States navy, was detailed by the department to take charge of the work, and as soon as he had made his preliminary examination of the site, reported that it was not feasible to build the dock by the use of ordinary methods. A new type of construction was advocated and finally adopted by which the foundation work would be prosecuted by the use of pneumatic caissons.

Preliminary Work.

An exhaustive set of core borings were driven at intervals over the site of the work, and caisson sinking began. Bed rock was found at a practicable level near the head of the dock, but at the entrance and for about half the length, it was found that reliance would have to be placed on the typical boulder and sand hardpan encountered.

The size of the dock was again increased to these final dimensions: 726 ft. long, over all; 139 ft. 6 in. wide at coping; 110 ft. wide at a point 35 ft. below M. H. W.; and 30 ft. over sill at mean high tide.

The dimensions as given above will take any ship capable of passing the locks of the Panama canal, not over 690 ft. long. Finding that the original plan of surrounding the site with a pneumatic caisson cut-off wall, within which a dock of the original type was to be built in the impounded material, would not be possible, owing to the impracticability of reaching rock with compressed air work at the entrance end, this design was of necessity abandoned. It had been proposed to build a heavy or gravity type structure resting on piles driven at regular intervals and close together over the entire area.

The inverted arch floor of concrete was to be 17 ft. thick, to resist the hydrostatic thrust when the dock was empty, and was so designed as to transmit this thrust to the side walls, of massive construction, whose additional weight was to make the whole structure stable, while the weight of the structure itself and of the supported ship was to be taken by the piles.

The construction, as outlined above, was found to be impossible without penetrating some distance into the unstable quicksand which underlaid the entire area. This was a fine sand, saturated with water, and when so saturated, flowing almost as freely as water itself. The removal of all top soil over the area would release this unstable material and its removal would become practically an impossibility.

The attempt to do just this thing was, in a large measure, responsible for the early failures.

Final Design.

In this dilemma, new methods were devised and it was fially decided to sink a continuous wall 5 ft. in thickness around the entire dock, either to rock or hardpan, and to finally incorporate this wall with the superstructure in such a way that it should become practically monolithic construction. Caissons 36 ft. long and 5 ft. wide were sunk end to end, in such a position as to be in line with the center of gravity of the dock wall above. Each end of these caissons was provided with a semi-circular recess, and these, abutting, were finally sealed with a solid concrete key, placed under pneumatic pressure. The structure as now designed contemplated a reinforced concrete floor slab, approximately 8 ft. thick. This was supported along the center and on two lines parallel to the center line by reinforced concrete piers, 7 ft. square. These piers were sunk in caisson to a point determined by the material encountered, till they reached a reliable bearing below the quicksand, when they were flared by poling boards to a minimum of 11 ft. square. The piers were located in ranks 20 ft. center to center longitudinally, and the side lines were each 24 ft. from the center line. This provided for the weight of a ship in dock being supported as a direct thrust on these piers, each of which provided 121 sq. ft. of bearing area on the firm stratum in which they were anchored. They further served the purpose of providing resistance against uplift from the hydrostatic pressure, being in effect immense mushroom anchors, the center line providing a resistance of 500 tons each and the side piers, which were not sunk to as great a depth, took care of 400 tons per pier.

Reinforcement.

The floor reinforcement was placed in such a way as to make the slab capable of beam action in both directions. This was necessitated by the fact that the three governing conditions of greatest stress, viz., with the dock empty and water pressure acting upward; with the dock flooded, and the weight of the structure and contained water acting downward; and with the dock pumped out with a ship in it, producing a heavy concentration on the supporting piers and floor; demand that a complete reversal of stress shall be provided for. It was necessary to provide for a maximum possible thrust upward on the bottom at mean high tide of 2,900 lb. per square foot, in addition to the ship loads given above acting downward and the weight of the structure itself; and 3.8 sq. in. of twisted steel rods were provided for each running foot of the dock floor, both top and bottom.

The surrounding caisson wall was reinforced by 60-lb. steel rails, placed vertically, on 2-ft. centers outside and 8-ft. centers inside of the wall. These rails projected so as to furnish mechanical bond with the superstructure at the point when the floor joins the sidewalls, 1-in. square twisted rods were placed at an angle of 45 deg., projecting toward the center line, 1 ft. center to center. Alternate rods were bent to a horizontal position so as to lie in the plane of the floor; the balance projected into the bulk of the side wall. Above the floor level the face of these walls was provided with short rods, 5 ft. by 4 ft. center to center, to provide bond with the bulk of the superstructure wall. The piers supporting the floor were reinforced vertically by 60-lb. rails and 3-in. diameter bolts which were allowed to project to interlock with the steel in the floor.

Arch Head.

The head of the dock is a semicircle of approximately 70 ft. radius. The caissons which enclose this space are made segmental in shape, and are 7 ft. thick, so that a horizontal arch of approximately 4 ft. thickness lies entirely within their mass. These features will be easily identified by reference to Fig. 1. The cut-off feature of the foundation wall was completed by two lines of caissons sunk across the mouth of the dock. These were 40 ft. apart, and so constructed that their vertical continuation formed a cofferdam, within which the gate sills, 25 ft. apart, and the connective entrance floor and sidewalls were laid in the open cut. This open working was braced in both directions by timber framing at right angles, successive tiers being placed as the excavation proceeded, the removal of excavated

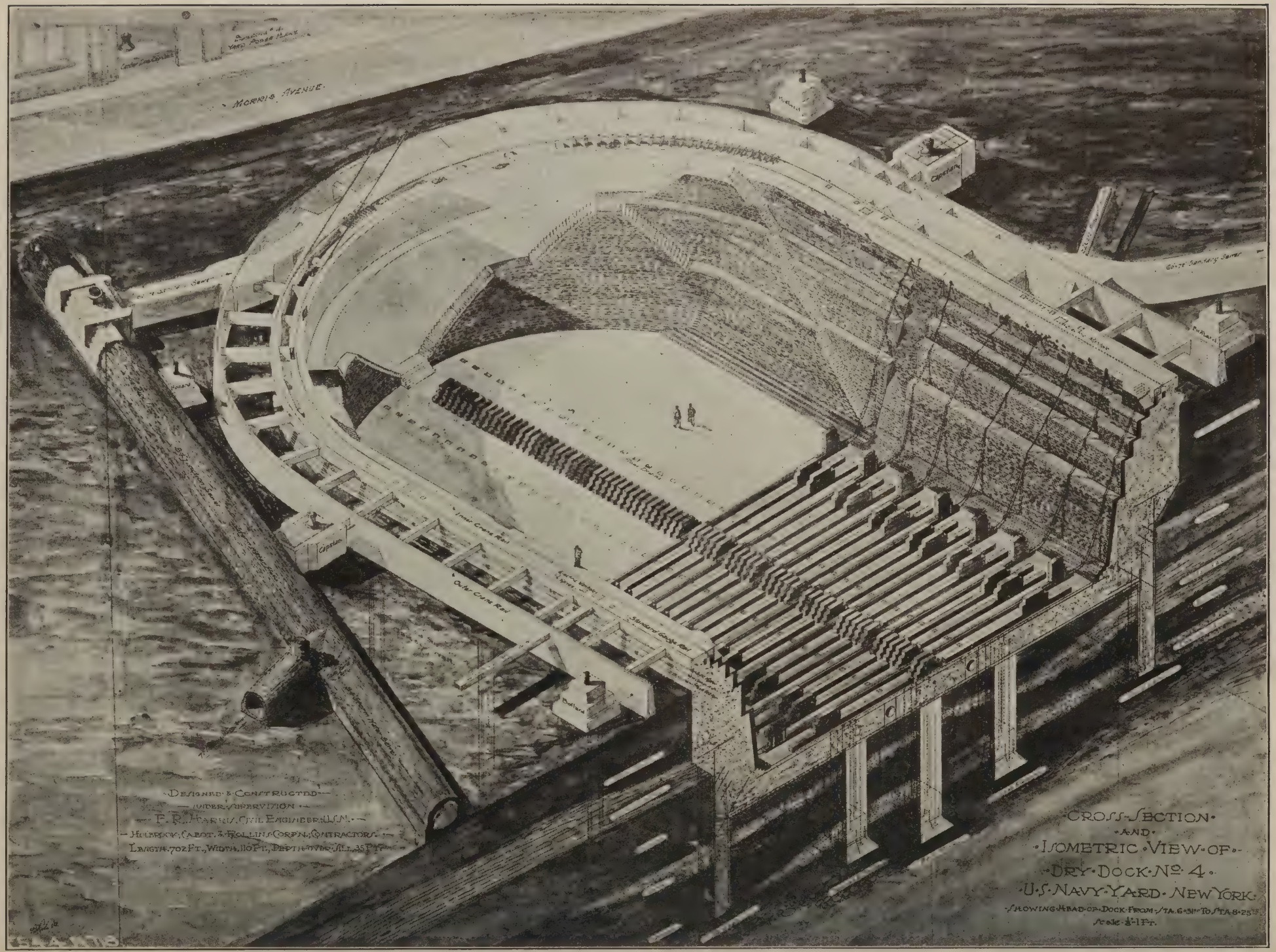

MORRIS AVENUE
DESIGNED & CONSTRUCTED
UNDER SUPERVISION
P. R. HARRIS, CIVIL ENGINEER U.S.N.
HOLBROOK, CABOT & ROLLINS CORP'N, CONTRACTORS
LENGTH 702 FT., WIDTH 110 FT., DEPTH AT SILL 35 FT.
CROSS-SECTION
AND
ISOMETRIC VIEW OF
DRY DOCK No. 4
U.S. NAVY YARD NEW YORK
SHOWING HEAD OF DOCK FROM STA. 6+51 TO STA. 8+25
Scale 1/8 = 1 Ft.

FIG. 1—CROSS-SECTION AND ISOMETRIC VIEW OF DRY DOCK NO. 4, UNITED STATES NAVY YARD, NEW YORK. ALL THE DETAILS REFERRED TO IN THE ACCOMPANYING ARTICLE ARE SHOWN IN THIS FIGURE, EXCEPT THOSE RELATING TO CAISSON GATE AND PUMP WELL

spoil and the introduction of structural material being accomplished through the square openings left in the bracing. When the entrance was completed, this bracing was removed and inclined braces resting on the granite sills held the face of the cofferdam against external pressure.

Owing to obstruction from the steel sheet piling left by the early contractors, it was necessary to make a digression in the line of the cut-off wall for a portion of the distance on both sides to permit this piling to be removed in the open interior excavation, made after the caissons were in place. Much of this had to be cut with the oxyacetylene torch, as it was impossible to pull it.

Floor Construction

When the cut-off wall and interior piers were all in position, the work of placing the floor began. The operation consisted of excavating a strip to subgrade from wall to wall, and placing in position struts made of four 12 by 12-in. timbers connected by lattice bracing, and bolted so as to act as one piece. Inequalities in length were taken up by short timber balks and paired wedges. These trusses were spaced 20 ft. center to center, and second, and in some instances, third tiers were placed and keyed, and longitudinal and sway bracing provided. The excavation between two adjacent struts was then carried to sub-grade and a strip of floor laid and finished. A space on each side was left undisturbed and other strips laid. When sufficiently set, the bracing was removed and the remaining segments of floor placed in position between the strip already in place. As the work progressed it was found possible to open wider spaces, and one piece of floor 45 ft. long, involving 1,700 cu. yds. of concrete, was put in place in 26 hours.

Holes in the floor provided for the pumping of infiltered water, thus relieving pressure on the floor until the side walls had been placed in sufficient mass to provide the necessary stability, when they were sealed, connections being left for pressure gages, by means of which it was found that the floor was successfully resisting the full hydrostatic thrust estimated on.

Dock Lining, Etc.

With the exception of the coping, abutment and gate sills, which are of New England granite, the facing of the dock is of hard burned vitrified brick, except at the head, above the stair line, where the face is concrete. The 14 stairways are of concrete with Wainwright nosings. Ten material slides are provided, 6 ft. wide, each side of each slide being an expansion joint.

Floating Caisson Gate

The gate for this novel structure is also a novelty in the United States, being of the hydrometer type which has recently been proved successful in European docks.

The pumping equipment is located in a well near the mouth of the dock, being an irregular pentagon abutting on the dock wall, built in caissons, similar to the cut-off wall and keyed to them. It is approximately 28 ft. wide and 50 ft. long. The pumping equipment consists of three vertical shaft, one-stage volute pumps, driven by 48 pole, three-phase, 60-cycle, 2,300-volt induction motors, with 54-in. diameter intakes and 48-in. diameter discharge ends. These pumps have a rated minimum capacity of 8,800 cu. ft. per minute under the maximum head, and are capable of emptying the dock in one hour and 20 minutes continuous run. Two 15-in. pumps of similar type are provided to handle the water below the vacuum level of the large pumps and to handle drainage. Both sets of pumps are provided with motor-driven stop valves, and necessary checks. The floor of the dock is provided with four openings, 16 ft. by 6 ft., which connect directly by tunnels 6 ft. square to a forebay in the mass of the dock wall. The discharge is into a culvert built into the wall, 10 ft. wide by 16 ft. high, and opening to free water outside the gate. The floor is also traversed for its full length by two drains, 3 ft. diameter, with intakes 4 ft. apart, to facilitate the removal of water impounded between the blocking on the floor, and to handle drainage when a ship is in dock. These connect with the openings into the forebay.

Supply Lines

Electrical service is supplied through conduits laid in the side walls, with numerous manholes, and outlets on the face of the dock above high water. Submerged outlets with watertight connection boxes are also provided at two points below water level.

Salt water, fresh water and compressed air are supplied by 6-in. diameter mains encircling the structure with branches to the face of the dock wall.

Three capstans are provided on each side, and one on the center line at the head of the dock. Nineteen bollards, of obsolete guns set in concrete blocks, are placed at regular intervals along the sides.

A crane track, 18 ft. gage, encircles the dock, the inner rail resting on the coping and the outer rail on a continuous concrete girder 8 ft. deep, supported on piles, providing a runway for the 40-ton cranes used in connection with the dock. Another rail, at standard gage from the inside crane rail, provides for small locomotive cranes and other standard gage rolling stock. A standard gage track also crosses the caisson gate, connection being made at either end to the yard railroad tracks. Figure 1 shows these details clearly.

The plan, as outlined by Mr. Harris and carried to successful completion by Fred Holbrook, who had immediate charge of the work for his firm, has been successful in all respects, and the completed dock was emptied for a ship on May 9, 1912, only two years and a half after work began.

In the caisson work, 32,000 cu. yds. of concrete was placed. The remaining work required approximately 60,000 cu. yds.; 2,000 tons of reinforcing steel were used. The total cost is about $3,000,000. Taking into consideration the fact that the work has been completed in the remarkably short time above mentioned, including over a year in caisson work alone, the interference from obstructions left by former contractors, the novel conditions to be met and provided for, often on the spur of the moment, and the unusual co-operation between engineers and contractors, it is safe to say that a record for speed and economy in work of this character has been successfully established; and that all concerned have a legitimate source of pride in its successful conclusion.

Trial Trip of Battleship Arkansas

The official figures of the recent builders' trial trip of the battleship Arkansas have just been compiled by the trial board. The performance exceeds contract requirements. The fastest mile run on the standardization trial was 21.493; average of five high-speed runs, 21.153; average of four-hour run, 21.51; average of two-hour run, 20.989; maximum horsepower developed, 29,271.

The Western Maryland Railroad Co. has awarded to the Skinner Shipbuilding & Dry Dock Co., Baltimore, a contract to build two car floats for the company's service in Baltimore harbor. They are to be double-tracked, 230 ft. long, 33 ft. beam and 8 ft. deep.

Life Saving Equipment

The Steamboat Inspection Service Has Amended Its Rules Regarding Character of Equipment to be Carried

Since the Titanic disaster the general subject of safe-guarding life at sea has been given serious attention by both departments of the United States government. The United States, as is well known, has gone exhaustively into the subject and bills have been prepared embodying the results of the inquiry. Meanwhile the Steamboat Inspction Service has amended its rules regarding the character of life-saving equipment and has adopted the following regulations, which became effective on July 1, 1912, as follows:

For the purpose of apportioning lifeboat and life raft equipment, steam vessels under the jurisdiction of the steamboat inspection service now in service or under construction shall be classified in accordance with the service in which they are engaged, the various classifications to be designated as follows:

Ocean Steamers.

Under this designation shall be included all steamers whose routes extend 20 nautical miles or more off shore.

Coastwise Steamers.

Under this designation shall be included all steamers whose routes throughout their entire length are restricted to less than 20 nautical miles off shore.

Lake, Bay and Sound Steamers.

Under this designation shall be included all steamers navigating the northern or northwestern lakes, or the bays and sounds tributary to the waters of the Atlantic or Pacific oceans or the Gulf of Mexico.

In this class shall also be included steamers navigating the waters of the Atlantic or Pacific oceans or the Gulf of Mexico whose routes are restricted to 1 nautical mile or less off shore.

River Steamers.

Under this designation shall be included all steamers whose navigation is restricted to rivers exclusively.

Lifeboats Required.

All steamers other than steamers carrying passengers, except as otherwise hereinafter provided for, must be equipped with sufficient lifeboat or life raft capacity to accommodate at one time all persons on board. One-half of such equipment may be in approved life rafts or approved collapsible lifeboats.

Ocean steamers carrying passengers must be equipped with sufficient lifeboat and life raft capacity to accommodate at one time all persons on board, including passengers and crew. One-half of such lifeboat and life raft equipment may be in approved life rafts or approved collapsible lifeboats.

Coastwise steamers carrying passengers must be equipped with sufficient lifeboat and life raft capacity to accommodate at one time all persons on board, including passengers and crew; provided, however, that such steamers navigating during the interval between the 15th day of May to the 15th day of September in any one year, both dates inclusive, will be required to be equipped with only such lifeboat and life raft capacity as will be sufficient to accommodate at one time at least 60 per cent of all persons on board, including passengers and crew; two-thirds of such required lifeboat and life raft equipment throughout the year may be in approved life rafts or approved collapsible lifeboats.

Lake, bay and sound steamers carrying passengers must be equipped with sufficient lifeboat and life raft capacity to accommodate at one time all persons on board, including passengers and crew; provided, however, that such steamers navigating during the interval from May 15 to September 15, in any one year, both dates inclusive, will be required to be equipped with only such lifeboat and life raft capacity as will be sufficient to accommodate at one time at least 30 per cent of all persons on board, including passengers and crew; provided further, that such steamers navigating routes lying at all points within a distance of 5 miles from land, or over waters whose depth is not sufficient to entirely submerge the vessel in case of disaster, will, during the interval from May 15 to September 15, in any one year, both dates inclusive, be required to be equipped with only such lifeboat and life raft capacity as will be sufficient to accommodate at one time at least 10 per cent of all persons on board, including passengers and crew. Three-fourths of the lifeboat and life raft equipment required on lake, bay and sound steamers may be in approved life rafts or approved collapsible lifeboats.

River steamers carrying passengers must be equipped with sufficient lifeboat and life raft capacity to accommodate at one time at least 10 per cent of all persons on board, including passengers and crew. Three-fourths of such lifeboat and life raft equipment may be in approved life rafts or approved collapsible lifeboats.

Steamers of less than 150 gross tons while engaged exclusively in harbor towing may substitute one or more life rafts for the lifeboats required, when the lifeboats interfere with the practical operation of the steamer and such substitution may be made with safety, it being understood that when such vessel engages in service other than harbor towing she must be equipped with lifeboats as required by the rules.

Steamers of 50 gross tons and upward carrying passengers must have one working boat in addition to the lifeboats required. The cubical capacity of the working boat on steamers navigating the Red River of the North, rivers whose waters flow into the Gulf of Mexico, Yukon river and other similar rivers, the bars and channels of which are liable to sudden change, shall be included in the cubical capacity of lifeboats required.

Steamers that are used exclusively as fire boats and connected or belonging to a regularly organized fire department shall be required to carry only such boats or rafts as in the judgment of the local inspectors or supervising inspector may be necessary to carry the crew.

Stern-wheel towboats engaged exclusively in the business of towing shall not be required to carry lifeboats, but shall be required to carry such boats only, as in the judgment of the local inspectors will, by their number, capacity, character and equipment, fully provide for the safety of the crew of the vessel.

When a steam or motor launch is accepted as a lifeboat the space required for the engine, boiler, motor or fuel must not be included in the cubical capacity of the boat.

Vessels engaged exclusively in the business of seine fishing or wrecking may substitute a wooden surfboat or wooden seine boat for the lifeboat.

Watertight Subdivision of Liners

The Fiction of the "Unsinkable Ship" Has Been Shattered—Some Suggested Reforms in Ship Construction That May Come Out of the Titanic Disaster—Compared With Battleships the Present Design of Liners Appears Unsafe—The Elimination of the Watertight Door in Bulkheads

COMMODORE WILLIAM HOVGAARD

The one man in the United States who has given more attention to watertight subdivision of vessels than anyone else is William Hovgaard, professor of naval design and construction at the Massachusetts Institute of Technology, and it is quite natural that he should have had something to say regarding the Titanic disaster. He has discussed the subject thoroughly in Engineering, of London, and has reached some important conclusions which will undoubtedly be considered in future design of liners.

The fiction of the "unsinkable" ship has been shattered. It is well that this should be so, for it appears that on the strength of this fiction unwarranted risks have been taken one way and the other. Of the good things likely to come out of the terrible Titanic disaster, this disillusionment is, perhaps, not the least important. The risks connected with the navigation of liners will henceforth be estimated at their true value, and proper measures will be taken to meet them.

The reforms in point of navigation and boat equipment are obvious, and are already under way. The reforms in the construction of the ships are not so clearly recognizable, and admit of alternative selections. These reforms cannot meet the requirements in a complete measure, for a ship cannot be made unsinkable. The term "unsinkable ship", was a misnomer, which simply meant, if it meant anything at all, that the ships so-called were less sinkable than other ships. In other words, the "unsinkability" was a relative term, used as a soothing application by shipping men and by the public against uneasiness and doubts as to the risks that were taken.

Liner Design Seems Unsafe

Compared with battleships, the liner, as ordinarily designed, appears to the naval constructor positively unsafe. It is admitted that battleships are subject to greater dangers than liners, and that it would be impossible, from a commercial point of view, to endow liners with the same watertight sub-division as a modern battleship. The discrepancy is, however, far greater than justified by these considerations, when the liners attain the size and cost of ships like the Titanic, and, in particular, when several thousand human lives depend on the safety of the ship.

The Titanic had 16 large watertight compartments, separated by transverse bulkheads. A double bottom, divided in about 60 smaller compartments, was fitted along the greater part of the length, but transversely it extended only to the turn of the bilges. All the large compartments were, therefore, along the sides of the ship separated from the sea only by one wall of plating, the outer shell. It is in this region that damage by collision and by ice is likely to occur. Any such damage, even a very light case of puncture or tearing, would cause a large compartment to be flooded, and would put the ship in a serious situation (see Fig. 1).

By way of illustration, there may be mentioned the case of a liner, of 10,000 tons, which was run into by another steamer a couple of years ago outside the New York harbor. The ship was constructed as other liners, the double bottom extending to the turn of the bilges, as in the Titanic. The collision took place in way of the engine room. The outer plating was not even broken through, but a sea-valve fitted on the side above the double bottom was damaged. Through this valve the engine room was soon completely flooded, the ship had to be beached, and the repairs occupied two months. Had the double bottom extended up the sides, with a sea chest for the valve, the engine room would probably not have been flooded.

Sub-division in Battleships

In a modern battleship the shell is doubled everywhere on the immersed portion of the hull up to the armor shelf. Above the armor shelf, up to several feet above the water line, a cofferdam or some other form of cellular sub-division is fitted, making a total of more than a hundred water-tight compartments between the outer and inner shells. At the extreme ends of the ship cells or trimming tanks take the place of the double bottom. Inside the inner skin so formed, the hold of a battleship is now, moreover, subdivided in about 300 water-tight compartments, of which only the boiler and engine rooms are of large size. Abreast of these large compartments are fitted one, and generally two, longitudinal side bulkheads. Thus most of the large compartments in a battleship are separated from the sea by four vertical walls (see Fig. 2).

All the water-tight bulkheads in the Titanic, except two, or perhaps

three, bulkheads in the bow and one right aft were pierced by water-tight doors on a low level. If these doors were not closed, the water could flood the ship practically from one end to the other. The doors were placed just above the inner bottom, as low as possible, and therefore in the most dangerous position. Water-tight doors form points of structural weakness in the bulkheads. There can never be absolute certainty of their being closed in the critical moment; the personnel may fail to act, the closing mechanism may be out of order, the bulkheads may be warped, or the door opening may be blocked. Water-tight doors are, therefore, always a source of danger, and the more so the lower they are placed. Modern battleships are divided into a similar number of large sections by the main transverse water-tight bulkheads, but these have no doors on a low level. Each section forms an almost independent unit, having its own drainage, ventilation, and access along vertical lines. In order to pass from one section to another it is necessary to go up to a deck above or near the water line, through a door on that level, and then down again.

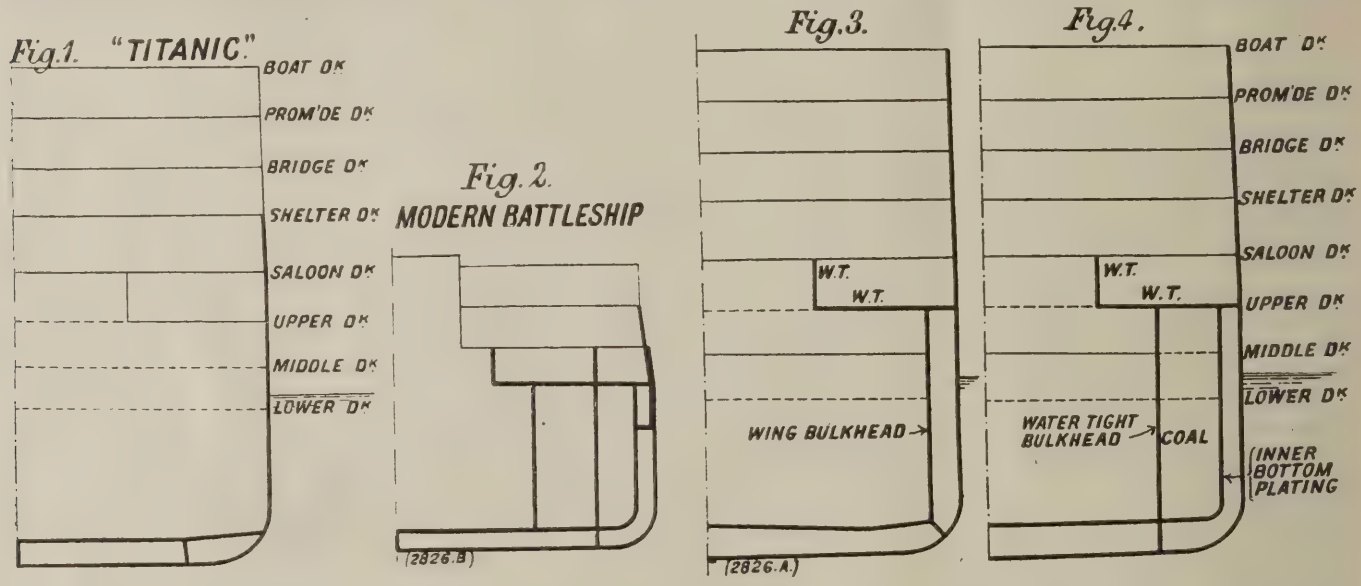
Seams and Butts Single-Riveted

The seams and butts of the Titanic were single-riveted. This construction, which may be of sufficient strength in ships of moderate size, provided the bulkhead plating is very minutely and rigidly supported, is hardly adequate in large liners, especially as the bulkheads near the ends of such long vessels may become exposed to enormous heads of water in serious cases of bilging, and then leakage, and even tearing, of the seams and butts is liable to occur. In the case of the Republic above referred to it appears that the engine room was flooded to a considerable height above the inner bottom. By leakage of the aft engine room bulkhead the water penetrated into the aft portion of the ship. The ship gradually settled by the stern, until finally, when she was taken in tow, several crashes were heard below, probably due to the carrying away of the bulkheads, whereupon the ship went down. Thus the loss of the Republic was probably primarily due to a weakness of the single-riveted seams and butts of the bulkheads.

When a large ship runs aground on a rocky bottom with anything but very slow speed, the pressures acting at the points of contact will practically always be greater than the plating of the outer shell is able to stand. Puncture, breaking and tearing will take place, and a shearing action, somewhat like that of a can-opener, will commence and will be continued until the energy of the ship's motion is exhausted. Similar conditions will exist by collision with a large iceberg or ice-floe, which is generally many millions of tons in weight; only the action will here ordinarily be along the side instead of under the bottom of the ship. While the total pressure, and generally also the intensity of the pressure, created initially, will be roughly proportional to the momentum of the ship, the depth and extent of the damage will be essentially dependent on the kinetic energy. For instance, the momentum of a ship of 60,000 tons displacement, going at 21 knots speed, is nine times as great as that of a ship of 10,000 tons going at 14 knots, and the kinetic energy is nearly 14 times as great. The plating of the former ship is barely twice as thick as that of the latter. It is clear, therefore, that even if we allow for a somewhat larger area of contact and stronger framing for the larger ship, the damage will go far deeper and will be more extensive in the larger ship than in the smaller. Hence the former is much less capable of resisting such action than the latter.

Shell Plating a Vulnerable Membrane

Relative to the enormous forces that may come into play by grounding, by collision with icebergs, and even by collision with other ships, the shell-plating of a large ship can only be considered as a thin vulnerable membrane, stretched over a more or less rigid framework. The action in such cases is not that of an impulse or shock, but resembles much more a relatively slow, irresistable punching, existing locally, and generally not straining the ship as a whole. This explains why collisions in large ships are generally not strongly felt except in the immediate neighborhood of the point of impact. It follows from these considerations that the larger ship, being more vulnerable than the smaller, should be relatively better subdivided, and it is particularly important that the outer shell should be doubled—in other words, that there should be an outer and an inner shell—over the entire immersed surface. Fortunately, it is possible to sub-divide a large ship much more minutely than a smaller ship without sacrificing an undue percentage of the useful internal space. It is, in fact, one of the intrinsic advantages of the large ship that, without inconvenience to the service, it may be subdivided to such an extent as to render it much safer than the smaller ship, even allowing for the greater vulnerability of the outer



shell.

The structural features here proposed in the construction and subdivision of liners are such as are thought suitable for ships of the size and type of the Titanic. The same features are applicable in principle also to liners of smaller as well as of larger size, with obvious modifications.

Structural Features Proposed

1. There should be a complete double shell extending from end to end of the ship, not only in the bottom of the ship, but also up the sides to a deck placed at least one deck height above the waterline amidships. In the Titanic the deck fulfilling this condition is the upper deck, which in that vessel was about one and one-half deck height above the waterline amidships. With the sheer usual in such vessels, this rule implies that at the ends of the ship the double bottom will be carried to about two deck heights above the water line. In the boiler and engine rooms and in the larger hold spaces the doubling should consist of a longitudinal wing bulkhead, placed some 4 ft. to 6 ft. inside the outer shell on each side of the ship. Such wing bulkheads can be made more independent of the outer shell than an inner bottom, and are, therefore, less likely to be strained in case of collision. They should be stiffened independently by stiffeners and by transverse bulkheads, subdividing the wing spaces into numerous compartments. These wing compartments should be treated as ordinary double-bottom compartments, accessible only through manholes.

Forward and aft of the large compartments the doubling should consist of an ordinary double-bottom construction, and the same may be used also abreast of the large compartments, where longitudinal bunker bulkheads are fitted along the sides, as in the Lusitania. Such bulkheads are indeed highly to be recommended, provided they are of sufficient strength to resist the water pressures and that they are provided with water-tight doors. The bunker bulkheads of the Lusitania undoubtedly fulfill these conditions, but no double bottom is fitted on the sides. The combination of a double bottom with a side bulkhead, even if not used in the boiler rooms, should in any case be fitted in the engine room, on account of the large size and importance of this compartment.

A wing bulkhead, as shown in Fig. 3, may be considered to give the minimum desirable degree of safety to a ship of the size of the Titanic. The combination of bunker bulkheads and double bottom, as shown in Fig. 4, gives a reasonable, by no means extravagant, measure of safety.

Doubling of the bottom, as here proposed, will not, of course, prevent flooding of the large compartments in all cases. The inner bottom or wing bulkhead may be strained or broken through, but even in such case it may often help to limit the flooding, for the damage may not everywhere be so deep-going.

Watertight Deck

2. The deck at which the double bottom and the wing bulkheads stop, generally the second deck above the water line (in the Titanic the upper deck), should be made watertight the entire length of the ship. The hatches in this deck, which must always be left open, such as funnel and engine room hatches and certain companionways, should be provided with watertight trunks carried up to at least one deck height above the watertight deck. Other hatches in this deck should be provided with watertight covers.

3. Let us assume that the main traverse bulkheads are distributed essentially as in the Titanic, dividing the ship in a number of large sections. In the Titanic each of these sections forms, in point of watertightness, but one compartment. It is now proposed that the sections in the bow region—in other words, to about one-sixth of the length of the ship from the bow—shall be sub-divided in a number of smaller watertight compartments. In fact, every opportunity of subdivision which offers itself in this region of the ship should be utilized. The partition bulkheads and decks, necessitated by the internal arrangements, should be made watertight, and the requisite watertight doors and hatches should be fitted. The aft end of the ship should be subdivided on similar principles as the forward end, although, may be, less extensively. The main watertight bulkheads should everywhere be carried at least to the height of the watertight deck. Near the ends of the ship the height of the bulkheads should be increased to one or two deck heights above the watertight deck, the highest bulkheads being found nearest the stem and stern. The collision bulkheads should extend to three deck heights above the watertight deck.

4. No watertight doors should be fitted below the watertight deck in the main transverse bulkheads in the bow region. In the remaining part of the ship the watertight doors should, wherever possible, be placed at a good height above the inner bottom, preferably near the water line.

5. The main bulkheads should have double-riveted seams and butts.

It is believed that by modifications such as here proposed in design and construction, to be more highly developed in case of a further increase in size, the large liners may be made as safe, and even safer, than the smaller liners. The Titanic disaster does, therefore, not show that a return to smaller ships ought to take place. This, in fact, would be a retrograde move. The larger ships offer so many and great intrinsic advantages that size ought to be, and must be, still further increased in the future.

The Titanic disaster does show, on the other hand, that the rules of the classification societies and of the board of trade should be radically changed, so as to embody a more elaborate watertight sub-division than hitherto used in this class of vessels. The additional first cost and running expenses incurred by such improvements in construction will ultimately be paid for in the form of higher passage money, or they may be met by a reasonable reduction in the claims to speed and luxury. The option between these alternatives may be left to the public, but in no case should the safety of the ship be compromised in order to meet the demands for extreme speed and luxury.

Diesel-Engined Vessel Indian

The Diesel-engined vessel which is being built by the Clyde Ship Building & Engineering Co., Port Glasgow, Scotland, for Norcross & Co., of Toronto, will be named Indian. She is of Canadian canal size, being 257 ft. in length, 42½ ft. in breadth and 26½ ft. in depth. Her engine will be of the Carels-Diesel type of 1,100 H. P., driving a single screw. The engine is of the four-cylinder two-cycle type with a bore of 18 in. and a stroke of 36 in. The cooling water is circulated by a pump driven by a steam engine, the steam for which is obtained from a donkey boiler furnished with oil fuel and which also operates the other auxiliary appliances throughout the ship. Sufficient fuel will be carried to keep the main engine running for 25 days. It is understood that the builders have guaranteed the vessel for six months of regular service.

Detroit—A Transatlantic Gasoliner

The launching of the little gasoline power boat Detroit, designed and built for the express purpose of crossing the Atlantic ocean under her own power, took place at the yacht yard of the Matthews Boat Co. at Port Clinton, O., the afternoon of June 25. Appropriate ceremonies connected with the christening of the tiny ship preceded the immersion, including a speech by Capt. Thomas Fleming Day, of New York, who will act as navigator on the ocean voyage.

Detroit was designed and built at the Matthews plant for Wm. E. Scripps, the well known newspaper man and manufacturer of Detroit, who for a long time has contemplated the construction of a power boat to conquer the western ocean. The hull dimensions are 35 feet over all, 9 ft. beam and 4½ ft. draught. In model she is practically an enlarged life boat with raised deck cabins fore and aft and a waist or bridge deck amidships. The frames are 2 in. by 2½ in., spaced on foot centers. The planking is 1¾ in. yellow pine below the waterline and 1½ in. cedar above. The bilge stringers and clamps are of yellow pine and are extremely heavy. Deck planking is 1½ in. pine, canvas covered, laid over 3 in. by 4 in. deck beams.

The interior quarters are very meager and consist of two built-in berths forward in which compartment will be stowed most of the stores and provisions. In the engine compartment is a pipe berth. Underneath the midship deck are five cylindrical seamless steel fuel tanks, each with a capacity of 200 gallons of gasoline which is fed under pressure to an auxiliary tank in the engine room aft. There are also two 200-gallon tanks on either side of the bridge, which makes all told from 1,200 to 1,400 gallons fuel capacity. In the forward compartment is a tank for 150 gallons of fresh water.

DETROIT—A TRANS-ATLANTIC GASOLINER

Her power plant is a two-cylinder 16 H. P. Scripps four-cycle gasoline marine engine turning a 24 by 26 in. three-blade propeller about 500 revolutions per minute. The engine will burn about 50 gallons of gasoline on 24 hours running and in that time will cover a distance of approximately 125 miles. On this basis it is estimated that Detroit will make the voyage from New York to Queenstown, taking the regular steamship track, in about twenty days. A novel arrangement for minimizing the effect of breaking seas is the carrying of two oil tubes through the hull on either side of the stem at the waterline which connect with a sight feed oil tank on deck. The boat is rigged with a pole spar and will carry an auxiliary trysail and two jibs to be used when the winds are favorable.

Complete dimensions and particulars of the boat are as follows: Length over all, 35 ft.; length water line, 33 ft. 2 in.; breadth water line, 8 ft. 10 in.; breadth over all, 9 ft.; draught, loaded, 4 ft. 7 in.; draught to rabbet, 3 ft. 3 in.; depth, 5 ft. 6 in.; least freeboard, loaded, 2 ft. 6 in.; freeboard, bow, 5 ft. 9 in.; freeboard, aft, 4 ft.; fore cabin, 8 ft. 5 in.; storage space, 9 ft.; engine room, 7 ft. 10 in.; headroom, fore cabin, 6 ft.; headroom, engine room, 5 ft. 9 in.; ballast iron shoe, 1,200 lb.; mast, 32 ft.; mast housing, 7 ft.; mast, deck to truck, 25 ft.; main-boom, 16 ft.; sail area, 240 sq. ft.; fuel capacity, 1,200 gal.; tanks, five, 8 ft. x 24 in.; two tanks, 8 ft. x 18 in.; water capacity, 150 gal.

Total displacement, including fuel, stores and crew, about 25,000 lb.

DETROIT—A GASOLINE POWER BOAT INTENDED TO CROSS THE ATLANTIC OCEAN
BUILT BY MATTHEWS BOAT CO., PORT CLINTON, O.

Freighter for Dominion Coal Co.

Sir Raylton Dixon & Co. recently completed at Middlesbrough a bulk freighter for the Dominion Coal Co. to operate between Sydney and Montreal. Her principal dimensions are 388 ft. 3 in. long, 52 ft. beam and 29 ft. 9 in. and her carrying capacity will be about 7,600 tons. She is of cantilever construction with top side water ballast tanks. She is of the single deck type with poop, bridge and forecastle and has been built to the highest class of British corporation. She has eleven hatches and her hold is divided into four compartments. The vessel has twelve derrick posts and twenty derricks, four boats, hand and steam steering gear and is equipped with ten steam winches, steam windlass and the latest appliances for the rapid handling of cargo. The steamer is equipped with triple-expansion engines, having cylinders 26.44 and 73 in. diameters by 48 in. stroke supplied with steam by three large single ended boilers, working at 180 lbs. pressure.

The Louisiana state senate has passed a bill exempting American steamship companies from taxation in Louisiana.

Power Boat for Government Engineer

The Nemadji, built by the Racine Boat Co., of Racine, Wis., for the United States engineer office, Duluth, Minn., which was recently delivered after a satisfactory run of 700 miles, is a strictly up-to-date power tug, of the following dimensions: Length over all, 60 ft. 9 in.; length water line, 55 ft. 10 in.; extreme beam, 12 ft.; draught, 4 ft. The power plant consists of one 100-H. P., 6-cylinder, 4-cycle Standard marine engine. The

TUG NEMADJI FOR THE GOVERNMENT ENGINEER AT DULUTH, EQUIPPED WITH STANDARD MARINE ENGINE
BUILT BY RACINE BOAT CO., RACINE, WIS.

tug is of heavy construction, the keel being made of clear well-seasoned white oak, sided 6 in. and tapered to 4 in. at after end, and molded to an average depth of 8½ in., 11 in. at the after end and 7 in.. where scarphed to stem knee.

The center keelson is of long leaf yellow pine, sided 6 in. and molded to a depth of 4 in., and in one length. The side keelsons are of yellow pine, sided 3 in. and molded 2½ in. Clamps of yellow pine, 2 in., molded to a depth of 6 in., and tapered forward and aft to 2 in. by 4½ in. The frames are of white oak, sided 2 in. and molded 2 in. at the hood and 3 in. at the heel, spaced 12 in. center. The bilge stringers are of yellow pine, sided 3 in. and molded 2½ in., and tapered to 3 in. by 2 in. The side stringers of yellow pine, 3 in. by 2½ in., tapered to 3 by 2 in. The stem is of white oak, sided 6 in. and molded to a depth of 18 in. The stern post is of oak, sided 8 in. The garboards are of white oak, 3 in. thick. The next two planks and the garboard are 1⅞ in. thick. The balance of the planking is 1¾ in. thick.

The planking, except garboard and sheer strake, are of long leaf Georgia pine. Two water-tight bulkheads forward and aft also help to strengthen the hull. In extreme fore peak is located chain locker, etc., aft of which is the crew's toilet, wardrobe, etc. Aft of this is the crew's quarters, with sleeping accommodations for four persons. The engine room is aft of the crew's quarters, and here also is installed and connected to the engine a dynamo of 15-volt, 15 ampere capacity, with storage battery 13 volts 120-ampere, and switchboard for lighting purposes. Suitable fixtures and lights are distributed throughout the boat.

Aft of the engine room is the galley, which is fitted with toilet, ice box, sink, cooking stove, etc. A hot water heating system is also installed in the galley, with radiators in the pilot house, crew's quarters and officers' saloon. The officers' saloon is just aft of the galley, and is fitted with desk, large folding ship table, and two Pullman berths. The pilot house is above the crew's quarters forward and is fitted with binnacle, compass, wheel, barometer, chart case, etc. Large locker seats are also provided. The finish in the pilot house and officers' saloon is antique, the engine room and crew's quarters marine white. All floors are covered with a heavy inlaid linoleum, and all seats and chairs are upholstered in leather. All equipment, such as anchors, chains, windlass, sailing lights, flags, etc., is included.

Oil Engined Vessel Eveston

The oil-engined vessel Eveston, equipped with engines of the Carels-Westgarth type, manufactured by Richardson, Westgarth & Co., Middlesbrough, was launched from the yard of Sir Raylton Dixon & Co., Middlesbrough, last month. This vessel is of the cargo-carrying type to carry 3,100 tons deadweight and at 4,400 tons displacement is to steam at 10 knots. The engines of the two-stroke Diesel system are of the open crosshead design, resembling closely marine steam practice. There are four cylinders, 20 in. in diameter by 36 in. stroke, arranged to run at 115 revolutions per minute. The scavenging air pumps and the water pump for cooling the cylinders and pistons are placed at the back of the engines and are driven by levers from the piston rod crossheads just as the pumps of a steam engine are arranged. The high pressure air compressor is placed at the fore end and is driven by a pin on the end of the crank-shaft. All the auxiliaries normally required for operating the engines are driven by the engines themselves so that it will not be necessary to run any other machine when at sea. The Eveston will compete with steam-driven vessels on a thirty days' voyage and will have many advantages over the steam-propelled boats, owing to the saving in weight despite the higher cost of oil fuel. It is claimed that there is a saving in weight of machinery of 68 tons as compared with a steam plant, while for a thirty days voyage 450 tons of coal has to be carried as against 120 tons of oil fuel, meaning 330 tons additional cargo carrying capacity.

Dock Trial of Diesel Engine

The marine Diesel engine which the New London Ship & Engine Co., Groton, Conn., built for one of the Standard Oil Co.'s barges, was given a dock trial at Port Richmond, New York harbor, recently, to the satisfaction of both builder and owner. The design of this barge follows the usual practice of the Standard Oil barges with the exception of the power plant. The hull is subdivided by nine oil-tight bulkheads into ten compartments. Eight of these compartments have tanks for carrying cargo, while the forward compartment contains cargo pump, chain locker and other equipment. The after compartment contains the heavy oil engine and fuel oil tanks.

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Wireless on Board Ship

Some definite conclusions have been reached by the International Wireless Conference which convened during the present month in London, and it is quite clear that wireless telegraphy is regaredd by the Conference as the chief life saving agency aboard ship. It is understood that among the provisions of the agreement is one for very careful regulation of the S. O. S. distress call, and in the last ten minutes of every hour wireless operators on all vessels will be compelled to keep silent in order to catch any possible distress signals. All wireless messages are to have a separate classification, such as commercial, government, navy and military. Weather observations will be given the right of way over all commercial messages. All vessels will be divided into classes and vessels of the first class will be required to carry an auxiliary wireless apparatus on the top deck. The next international wireless conference will be held in Washington in 1917. Navigators recognize the fact that an alert and intelligent wireless is the primary safeguard of life at sea. More dependence must be placed upon continual wireless service than on lifeboat equipment. A variety of causes may operate to make a lifeboat useless.

Economy in Operation

One of the big items of expense in the operation of a steamer is the fuel bill, and it is multiplied in exact proportion to the number of vessels in the fleet. Any economy that can be achieved in this direction is important, for it may mean, if not an extra dividend, at least a partial payment of interest on bonds. It will probably be recalled that in the January MARINE REVIEW we printed some figures showing what results had been secured by an intelligent analysis of the conditions existing in the engine department of a well-known line of package freight steamers. At our request, the management has now supplied us with supplemental data, which will be found in another column in this issue. The results speak for themselves and are of great interest to every vessel owner, for what is possible in the engine room of one steamer is possible in the engine rooms of many others.

Under the fierce competition of modern industrial life, the railways have taken the leading part in seeking that efficiency which makes for economy. The workmen are taught that for the price of a railway axe a car may be hauled a given number of miles; and the railway in question is allowing no item of expenditure to go unchallenged. The fuel bill, as stated, is one of the big items of operating cost; one of the three largest in fact and of the three probably the only one on which much impression can be made. The ships of their fleet represent modern practice and while not new, none are old so far as steel ships are concerned and no radical engineering changes have been made since they were built. But that was not sufficient to satisfy the railway. Could they be bettered? The data submitted present a most conclusive answer.

The lake trade is one in which large sums of money were formerly realized upon small investments. It has always been until lately a profitable business, enormously so in certain years, and if the vessel owner was careless of his operating expense, he came honestly by his indifference. But times have changed. He cannot afford to be satisfied, but must seek for economy wherever he can find it; and considering the system and conditions under which the bulk of tonnage has been constructed, he will probably find it in his engine room. There is only one way to make steam; there are a thousand ways of using or wasting it. In these days of low freights and small earnings there are doubtless a number of ships that can be made a place on the paying side and there are none whose earnings are so large as to make improvement a matter of unconcern.

Private Monopoly of Terminals

The time is fast approaching when such a thing as private monopoly of water terminals will cease to exist. The hand-writing is already on the wall. There is a growing disposition on the part of municipalities to own their own wharves; and there is also noted a jealous guardianship on the part of the Interstate Commerce Commission of the rights of individual shippers in the privately owned terminal. A notable example of private ownership is to be found in the port of Seattle. This municipality has just closed its first lease for the use of a public wharf, the lessee

being the American-Hawaiian Steamship Co. In this lease the right is reserved to require the company to give accommodations to other than its own vessels, and common use of the railroad tracks is obligatory. Rates are subject to the control of the commission and statistics as to business transacted must be submitted at stated intervals. It would seem as though the commission had safe-guarded the rights of the individual shipper in the provisions of this lease.

In this connection the Interstate Commerce Commission recently handed down an important decision in the case of the Chamber of Commerce of Mobile against the Southern railway and the Mobile & Ohio railroad, which marks quite a step forward in the abolition of monopolies in wharves and docks. To understand the importance of this decision it will be necessary to relate the circumstances surrounding the situation in Mobile. The Southern railway and the Mobile & Ohio railroad own docks at Mobile, to which they make shipside delivery on export traffic. They publish rates to and from these docks which include not only the service of carriage to Mobile, but the supplemental service of switching to their wharves, the use of the docks and the unloading of the cars. For these services no separate terminal charge is made, the value of the service being included in the one published rate. It, therefore, cannot be ascertained how much the railway charge may be for delivery to another carrier at Mobile when the shipment is destined to some other dock. The two railways work in unity at both docks, that is to say, the Southern will deliver to the Mobile & Ohio docks and vice versa.

The upshot of this arrangement was to make these docks the waterside terminals of the two railroads at which ships may call for the receipt or delivery of freight. There were ships calling at Mobile, however, that could never gain access to these docks, notwithstanding the fact that they carried freight for the railroads or were seeking freight carried by them. These ships were denied access to the docks because the docks were given over to certain preferred lines of steamships with which the railroads had made certain arrangements. These vessels were, therefore, forced to berth at other docks on the waterfront and the shipper was compelled to pay a series of charges for switching, docking and unloading, in addition to the published rate of the two railroad docks.

The result of this practice was obviously to drive export trade away from Mobile. This was the Chamber of Commerce's first cause of complaint, but there was another and equally serious one, and that was that if freight was destined via some other wharf from an interior port, the railroads would not issue a through bill of lading, although if the shipment passed over one of their own wharves for Europe by one of the preferred lines of steamships, such bill of lading would be issued.

The answer of the railroads was that they preferred one boat line over another for their own protection, but the Interstate Commerce Commission did not hold this reply to be in good faith because in the first place the through bill of lading expressly limits the railroad's liability to the land haul, and in the second place steamship lines, notably the Elder-Dempster Line, which was refused through bills of lading at Mobile, were granted them at New Orleans. The text of the Interstate Commerce Commission decision is as follows:

First, where a railroad has a wharf, to which its tariffs offer delivery and at which part of the shipping public is served, such a wharf becomes a public terminal, and if all shippers are not given access to it by the boats they choose to employ, it then becomes the carrier's duty to make delivery at other available docks at the same rate.

Second, a railroad has a right to reserve wharves for its own use and for the use of such water carriers as it prefers, provided it affords to the public access to facilities elsewhere at equal rates.

Third, where a rail carrier making a rate to a port institutes a practice of authorizing its agents to issue bills of lading for water lines, it must extend such practice to all water lines under reasonable regulation.

The report of the Interstate Commerce Commission was prepared by Commissioner Lane, who concludes as follows:

"This, then, are the things desired by the Mobile Chamber of Commerce; that the Southern and the Mobile & Ohio railroads shall make all wharves in Mobile serviceable to the export and import traffic of that port, either by making the expense of shipside delivery the same to all, or by separately stating the nature of the terminal service given by the railroads in what is known as shipside delivery, and establishing separately the charges therefor, so that those shippers who do not wish that service or cannot get it by these railroads, but do wish similar service elsewhere, may not be forced to pay extra therefor; and that in any event through bills of lading, if given via one route, shall be given via others within reasonable limitations.

"We are persuaded that where a railroad has a wharf at which its tariffs offer delivery and at which part of the shipping public is served, but to which it does not give all access, it must make delivery at the same rate at some other wharf."

This decision affects every port in the United States. The Interstate Commerce Commission took the view that if the Mobile & Ohio and Southern railroads could in Mobile say to what wharves and docks they would deliver export trade—for it practically amounts to that when an additional charge to the regular tariff is made for delivery to other wharves—that any railroad in any port could do the same thing, and only such traffic would move through the port as the railway saw fit to give it, with the result that the millions expended in harbor improvements by the general government would be for the exclusive benefit of railroads controlling the terminal situation. The ruling went into effect July 1.

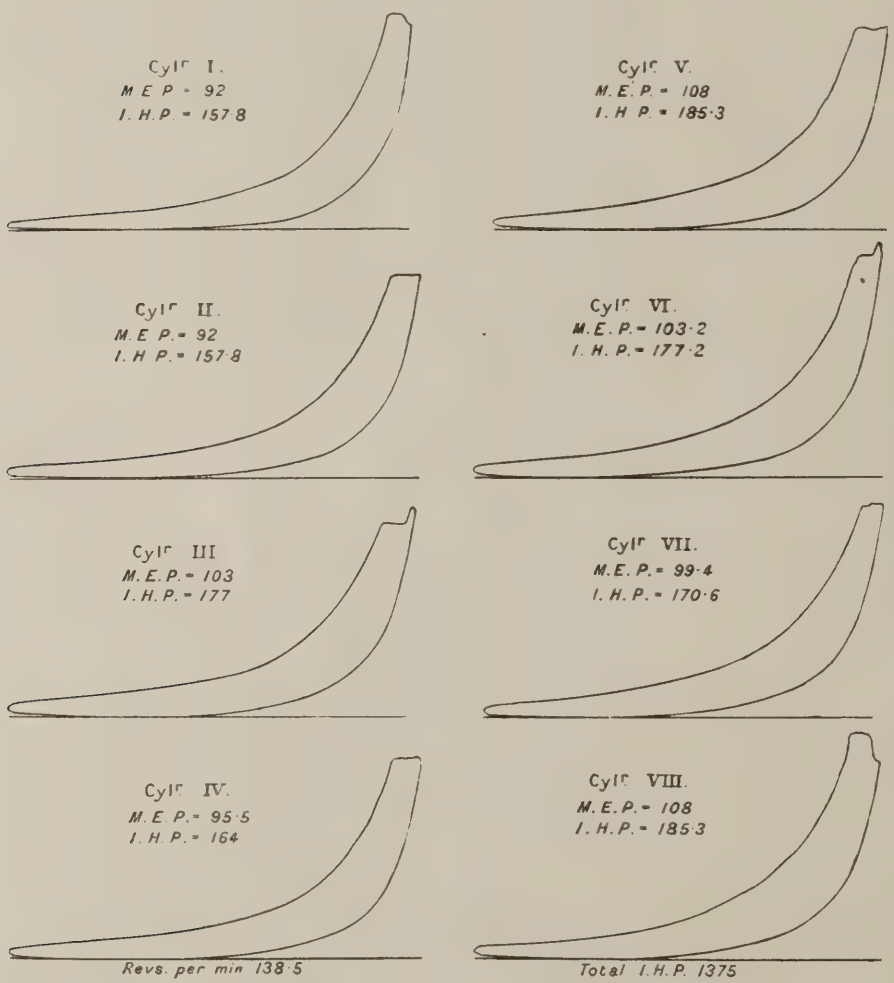
Diesel-Engined Ship Jutlandia

The oil-engined ship Jutlandia is the first British-built passenger seagoing vessel fitted with Diesel oil engines to be completed and has now concluded all her trials. She is 370 ft. in length between perpendiculars, 53 ft. beam and 30 ft. molded depth, and has been built and engined by Barclay, Curle & Co., Whiteinch, Glasgow, for the East Asiatic Co. The Jutlandia is a sister ship to the Selandia, built by Burmeister & Wain, of Copenhagen, and which was described in the May issue of THE MARINE REVIEW. The main engines of the two ships are exactly similar. The only points of difference in the installation are to be found in the method of driving and the disposition of the auxiliaries, and the pipe arrangement. The Selandia has two pumps driven by compressed air, whereas, in the Jutlandia, all the pumps are electrically driven, with the exception of the stand-by steam-driven compressor. The auxiliaries have been so disposed that the space between the two main engines is entirely clear of pumps. On the main engines a pointer is provided to show the direction of rotation, so that when this pointer coincides with another, marking the setting of the cam-shaft, fuel oil may be turned on.

The donkey boiler which supplies the steam for heating and for the auxiliary compressor, stands between the thrust-blocks. Any leakage of fuel oil from the burners of the boiler is caught in a scupper formed by a caulked angle iron.

On her trial, unfortunately, a slight mechanical breakdown, such as may happen to any engine at any time, occurred with one of the main engines just at the commencement, and the cruise was taken with only one of the main engines running. Under these onerous conditions, with only one engine and its auxiliaries running, and with the rudder over against the propeller, the ship was remarkably steady. From the set of the indicator card taken off one set of engines, published herewith, it will be seen that the mean indicated horsepower per cylinder is 172, the greatest variation in any one cylinder from the mean being 14. The mean effective pressure is 100.25 lb. per square inch, the greatest variation being 8.52 lb. The Jutlandia is constructed with a 3-ft. frame pitch, and the distribution of material proved to be effective under the conditions mentioned.

All the trials had previously been successfully passed, and a speed of 12 knots was then maintained for some hours, the main engines developing nearly 2,800 indicated horsepower with a consumption of fuel oil at the rate of 10 tons for 24 hours running. This figure includes rightly the fuel oil required by the auxiliary Diesel engines to generate the current for working the auxiliaries of the main engines. This consumption works out at 0.4 lb. per brake horsepower per hour (assuming a mechanical efficiency of 84 per cent), a remarkably good result. The oil used was Scotch shale oil, of a specific gravity of 0.855, but in ordinary service the engine will use the heavier oils obtained at Bangkok.



SET OF INDICATOR CARDS FROM THE ENGINES OF THE JUTLANDIA

Bonds on Canadian Steamers

The Canadian Interlake Line, Ltd., managed by Norcross & Co., of Toronto, are floating an issue of $520,000 of 6 per cent first mortgage 15-year sinking fund bonds, secured by the steamers Canadian, Acadian, McKinstry and Renvoyle, which are now in service, and the Indian, Hamiltonian and Calgarian, now building. The value of the first four is given as $584,683, and the last three, $458,275, a total of $1,042,958. The average net earnings of the Canadian, Acadian, McKinstry and Renvoyle have been $57,485. During 1911 they earned $62,797.40. The annual net earnings for the Indian, Hamiltonian and Calgarian are estimated at $60,000 and the net earnings of the whole fleet in an ordinary year are estimated at $120,000. The combined carrying capacity of the fleet is 825,000 bu. and their regular route would be between Montreal and Port Arthur and Fort William. The Hamiltonian and Calgarian are building at the yard of the Western Ship Building & Dry Dock Co., at Port Arthur, Ont., and the Indian at the yard of the Clyde Ship Building & Engineering Co., Port Glasgow, Scotland.

The Johnson Iron Works, New Orleans, has recently completed a steel sternwheel steamer, 100 ft. long, 24 ft. beam and 4 ft. deep, for service in Mexico. They have also completed a river steamer for the Mississippi River Quarantine Commission, 135 ft x 28 ft x 5 ft., and a steel barge 100 ft. long, 35 ft. beam and 5 ft. deep for service in New Orleans harbor.

Trials of Submarine F-3

The First Vessel of Its Type to be Built in Puget Sound—Its Performances Satisfactory

Unusual interest has attached to the present official government trials of submarine F3, because this diving craft is the first of this type ever built on Puget Sound. F3 was built at Seattle by the Seattle Construction & Dry Dock Co., under the plans and the contract held by the Electric Boat Co., of Groton, Conn. Following successful preliminary tests, the submarine has performed satisfactorily to designers and builders thus far and it is believed that the government board will have no hesitancy in recommending the acceptance of the vessel by the navy department.

Submarine F-3 Undergoing Her Trials in Puget Sound
Photo by Webster & Stevens, Seattle

Already F3 has been subjected to several of the tests required by the government and shortly it is expected to complete the final trial. This is being done under the direction and observation of a government trial board, of which Capt. C. F. Pond, United States navy, is the president. Not a few vessels, filled with interested spectators, have followed F3 in her wanderings about Puget Sound and Elliott Bay, for the submarine is a strange craft in these waters.

Work on F3 and F4, the contract for which was awarded at the same time, has been held back by the rejection by the government of defective engine material, including a defective crank shaft. This, it is stated, was the fault of neither designer nor builder, both of whom have been extremely conscientious in trying to meet with every requirement of the government.

The official trials of F3 were begun June 17. The vessel was first sent to Port Townsend, 39 miles down Puget Sound, where the Electric Boat Co. has had a nautical mile laid out. This mile was checked for the government by the coast and geodetic survey service and pronounced correct. This course was used for trials under a light condition, awash condition and finally a submerged condition. Part of the course was used for determining the vessel's turning radius, these trials being made after standardization. Following this the submarine returned to Seattle for further trials in Elliott Bay, using the plant of the Seattle Construction & Drydock Co. as a base. These trials included four hours full speed fuel consumption test, three hours battery discharge, one hour submerged at high speed and finally balancing under the surface at various depths. Then followed a 24-hour endurance trial in the Straits of San Juan de Fuca, beyond the limits of Puget Sound, to conform with the requirements of a trial in the open sea.

During one of the trials dummy torpedoes were fired by F3's tubes. Instead of using the regular torpedoes in vogue in the navy, the loss of which fixes a heavy penalty upon the builders, the Electric Boat Co. obtained permission to use dummy torpedoes. Consequently several cast iron dummies have been made and it is stated that these are sufficient to demonstrate whether or not the tubes operate satisfactorily. Tests yet to be made include those of submerging to a depth of 200 ft., finding the center of gravity by inclining the vessel under water and trials at a depth of 15 ft. When the craft is submerged to a depth of 200 ft. with a crew inside, an extremely heavy weight is dropped to the bottom by means of which the submarine pulls herself to the bottom with a motor windlass. During this test those inside are in telephone communication with the surface and, should anything go wrong and necessity require, the cable can be instantly severed with a cable cutter. At 200 ft. the pressure is 92 lb. to the square inch, which speaks for itself as to the strength of construction in these vessels.

From unofficial information it is learned that on the first trial over the course the required speed was attained. This is regarded as a most satisfactory achievement as the heavy oil burning engines come to this coast assembled. To place them in the boat they must be taken apart and rigged up perfectly. F3's preliminary trials covered a period of but ten days for the purpose of tuning up and adjusting the machinery. According to the same source, F3 developed a surface speed of over 14 knots, while, submerged, she did

A REMARKABLE SNAPSHOT OF A WARSHIP'S RAM OUT OF WATER
The British Cruiser Pegasus of the Australian Station in a Rough Sea in Australian Waters

better than 11 knots. It is stated that these trials were very satisfactory, although under the confidential contracts by which this work is being done, the government specifications and requirements are not made public. As heretofore stated these submarines are propelled by 6-cylinder, 4-cycle, heavy oil burning, internal combustion engines of the Diesel type.

That the staunchest construction is required is evident by the hazardous nature of the employment of these craft. For instance, the water ballast tanks are tested to 75 lb. to the square inch, while the fuel tanks are subjected to the same test in addition to 15 lb. of air. The motors are all built to the stringent tests of the Electric Boat Co., in addition to 100 per cent overload. Every rivet and every piece of material is thoroughly inspected and no work done for the government is so closely watched as is that in these submarine vessels.

The Electric Boat Co., under its government contracts, is building two more submarines at the Seattle Construction and Dry Dock Co.'s plant. No. 30 is about 65 per cent completed and No. 35 is about 25 per cent completed. F4, which was launched with F3, will be ready for preliminary trials Aug. 22, and it is expected to have her ready for the official trials about Sept 7. In addition to building four submarines at San Francisco, the Electric Boat Co. is building at the Seattle plant two submarines for the Chilean government. These are already about 15 per cent completed.

British Committee on Bulkheads

The president of the British board of trade has appointed a technical committee to advise him in the interests of safety of life at sea with regard to the internal sub-division of vessels of all classes by watertight bulkheads and other means. The reference to the committee is to advise:

(1) As to what, in their opinion, would constitute efficient sub-division with regard to each of the classes of vessels included in the rules for life-saving appliances made by the board of trade under Section 427 of the Merchant Shipping Act (1894), having due regard to the nature of the service in which they are respectively engaged.

(2) Whether, independently of the foregoing, the committee desire to make any recommendation with reference to the sub-division of vessels already built or new vessels, which would, in their opinion, contribute to the safety of life at sea.

The committee is constituted as follows:

Archibald Denny, of William Denny & Bros., Dumbarton, naval architect (chairman).

James Bain, late superintendent engineer of the Cunard Line, engineer.

H. R. Champness, assistant director of naval construction, admiralty.

G. B. Hunter, of Swan, Hunter & Wigham Richardson, Ltd., Wallsend-on-Tyne, naval architect.

Summers Hunter, of the Northeastern Marine Engineering Co., Ltd., Wallsend-on-Tyne, engineer.

J. Foster King, chief surveyor of the British Corporation for the Survey and Registry of Shipping.

Andrew Laing, of the Wallsend Slipway & Engineering Co., Wallsend-on-Tyne, engineer.

W. H. Luke, of John Brown & Co., Ltd., Clydebank, naval architect.

S. J. P. Thearle, D.Sc., chief ship surveyor of Lloyds Register of British and Foreign Shipping.

J. J. Welch, professor of naval architecture, Armstrong College, Newcastle-on-Tyne.

It is recognized among naval architects and ship builders that the inquiry should delve deeply into:

(1) The design and construction of watertight bulkheads, with special reference to those having very large unsupported areas, not backed up by

decks at near intervals. In the Titanic the inter-boiler-room bulkheads were peculiarly of this character, and it is difficult to see that they needed less framing and constructional support generally than an equal area of the side skin of the ship.

(2) The necessity for wing bulkheads, deemed necessary in warships, and proved practicable in the Mauretania and Lusitania.

(3) The presence of doors in the principal bulkheads, and the arrangements by which it becomes possible for them to be re-opened while danger continues.

(4) The liability to leakage by reason of pipes taken through the bulkheads at various levels for steam, hydraulic, pumping, sanitary and other services.

Electric Drive for Lake Freighter

The successful introduction of the oil engine for marine propulsion is evidently wrapped up with some form of transmitting gear precisely as in the case of the petrol engine in land transport. Attempts are, of course, being made to so re-design the oil engine for marine work that it may run slow and reverse, but it cannot be said that the success attained in any except fine lined vessels has been such as to justify the move. When it becomes necessary to consider the case of such full forms of hull as are usual in barges, canal freighters, and so forth—and this is perhaps the most natural field for the crude oil engine—then some form of transmission gear between the engine and the propeller is desirable. Parson's experiments in this connection with turbine engines are well known and the work of Westinghouse, McAlpine and others on similar lines and of Foettinger, Janney and others in hydraulic mechanisms for the same purpose are equally important. It has remained for the General Electric Co., in America, and Mavor, in England, to work out for this purpose a scheme of electrical transmission which, though a more radical departure, offers greater possibilities than any other method. The splendid results already obtained by Emmett, and the practical investigations carried out by Mavor, on the Clyde, have not only placed the feasibility of the electrical drive for marine propulsion beyond dispute, but have also indicated lines of progress in the art leading to revolutionary results.

For some years John Reid & Co., of New York and Montreal, have advocated the electrical drive for the Canadian canal type of boat to the development of which they have devoted much time and ingenuity. Therefore, the recent placing of a contract in England for a Canadian canal freighter with Diesel engine and Mavor electric gear on arrangements proposed by John Reid & Co., and to plans and specifications approved by them, is a development of great significance, not only in the Canadian trade, but in shipping generally. There will be two high-speed six-cylinder Diesel generating engines developing about 350 H. P. each at 400 revolutions per minute, with their dynamos and exciters, while the propeller shaft will be fitted with a special squirrel cage induction motor for 80 revolutions per minute. The outstanding facts in this arrangement will be that externally and for all purposes of propulsion and maneuvering the hull and the propeller will be indistinguishable from an ordinary steam job, and what that means in the lake and canal trade anyone who has experimented with unusual types of vessels will easily realize. Each Diesel engine will run on its governor at a steady rate of revolutions and of course there is no reversing necessary. One engine can be cut out for adjustment without interfering with the other, and with very little loss of speed. This is most important and greatly improves the working and efficiency of the Diesel engine.

The saving in weight of engines and fuel over steam of same power runs to about 200 tons, fewer men are required in the engine room crew, the boilers with all their disadvantages are at last discarded, and the valuable boiler space occupied in a steam job is available for cargo.

The advent of this unique vessel on the lakes will be awaited with great interest, and in passing it should be noted that the extraordinary disabilities which the hopelessly inadequate St. Lawrence canals have imposed on the Canadian lake owner have incidentally been the means of hastening this revolutionary development in marine propulsion.

Steamer Henry Williams

The Baltimore & Carolina Steamship Co., Baltimore, have just added to their fleet the steamer Henry Williams, built to their order by the Harlan & Hollingsworth Corporation, Wilmington, Del., and intended for trade between Baltimore, Georgetown and Charlestown, S. C. The new steamer is 241 ft. over all, 235 ft. between perpendiculars, 39 ft. beam and 28 ft. deep, and is of the shelter deck type with three decks designed for cargo. There are four hatches. The steamer has hoisting machines and large cargo ports with air ports and doors in the upper part for thoroughly ventilating the cargo space, besides having ventilators.

The sleeping quarters for the members of the crew are situated in the forecastle with separate quarters for the firemen and seamen and separate mess rooms in the deck houses. Each is provided with a separate shower bath. The officers' quarters are in the deck house. The pilot house and captain's room are situated on the boat deck with a flying bridge on top of the pilot house.

The engines are of the triple-expansion, surface-condensing type, having cylinders 17, 27 and 44 in. diameters by 30-in. stroke. The cylindrical return tube boilers are each 11 ft. 3 in. diameter by 10 ft. 9 in. long, allowed 180 lb. working pressure. Each boiler contains two suspension type furnaces of 46 in. outside diameter and each attached to separate combustion chambers. Air and bilge pumps are on the main engine and other pumps are independent.

Lloyds Register of American Yachts

Lloyds Register of American Yachts has now reached its tenth edition and is just from the press of this great classification society. The total number of yachts registered this year is 3,533, about 60 per cent being in the power division. The relative decrease of the sailing yacht becomes more rapid each year. The changes from last year are for the most part made of dropping a number of the older sailing yachts, both large and small, and the addition of several sizes of gasoline cruisers, notably the raised deck launch of 28 to 35 ft. length and the cruiser of 75 to 100 ft. length. The additions to the sailing division of the fleet are comparatively unimportant. The clubs listed in the Register now include 578 yacht clubs and 39 associations and miscellaneous organizations. The burgees of these clubs to the number of 500 make up 13 color plates, and two more plates are devoted to the national ensigns, the international signal code and the weather bureau signals. The private signals of yachtsmen to the number of nearly 2,000 are also given in color, while the names and addresses of 3,350 owners are published. The Register also contains the American yachting trade directory.

Data of Battleship Florida's Trials

The battleship Florida, which was built at the New York navy yard under the supervision of Naval Constructor W. J. Baxter, underwent the official trials on March 23, in a rough sea and brisk wind off the Maine coast. In her four-hour trial at full speed she maintained an average of 22.08 knots, reaching a maximum of 22.54 knots which is said to be a world's record for a battleship, the British battleship Vangaurd having hitherto held this record with a speed of 22.50 knots. The following synopsis and average data has been deduced from her trials by the navy department.

U. S. S. FLORIDA OFFICIAL TRIALS, SYNOPSIS AND AVERAGE DATA

	4-hr. trial at full power.	24-hr. trial at 19 knots.	24-hr. trial at 12 knots.
Steam pressures.			
Pressure at boilers, gage	210.	202.	203.
Pressure at M. H. P. turbine. abs	173.	....	17.2
Pressure at H. P. cruis. turbine, abs	10.8	....	144.4
Pressure at I. P. cruis. turbine, abs	13.7	....	49.7
Pressure at L. P. turbine. abs	18.5	....	5.0
Pressure in oil system, gage	13.3	13.5	11.05
Vacuum, inches	28.4	28.6	29.6
Barometer, inches	30.2	30.1	30.4
Air pressure in fire rooms, in. of water	1.99	0.6	0.00
Auxiliaries, revolutions or double strokes.			
Main air pumps, double strokes	23.3	18.8	17.3
Main feed pumps, double strokes	26.3	20.6	16.2
Main circulating pumps, revolutions per minute	243.	200.8	161.8
Dynamo engines, revolutions per minute	1500.	1500.	.....
Forced draft blowers, revolutions per minute	712.	573.	.....
Oil pumps	43.	38.2	21.2
Temperatures.			
Injection, degrees Fahr	39.8	52.	45.
Discharge, degrees Fahr	64.2	67.4	56.7
Air pump discharge, degrees Fahr	66.9	71.3	55.6
Feed, degrees Fahr.	197.9	200.6	123.3
Engine room, working level, degrees Fahr	86.8	98.4	94.1
Fire room, working level, degrees Fahr	79.	98.	100.
Horsepower.			
Total shaft horsepower, main engines	40511.0	19359.0	4433.0
Total indicated horsepower, auxiliaries	1299.0	863.0	464.0
Total horsepower, all machinery	41810.0	20222.0	4897.0
Water.			
Pounds per hour, main engines	493428.0	251669.0	74543.0
Pounds per hour, auxiliaries	67352.0	56382.0	41843.0
Pounds per hour, all machinery	560880.0	308051.0	116386.0
Pounds per hour per shaft horsepower, main engines	12.18	13.0	16.81
Pounds per hour, per indicated horsepower, auxiliaries	51.85	65.33	90.18
Pounds per hour, per horsepower, all machinery	13.415	15.23	23.76
Deduced data.			
Shaft horsepower per square feet, G. S.	28.369	13.557	4.657
Pounds of coal per shaft horsepower per hour	1.644	1.793	2.463
Pounds of coal per horsepower per hour	1.593	1.717	2.23
Pounds of coal per square foot G. S.	46.63	24.314	11.47
Cooling surface, square feet per shaft horsepower	0.752	1.574	6.87
Pounds of water, evaporated per pound coal per hour	8.423	8.872	10.658
Number of boilers in use	12.0	12.0	8.0
Speed in knots per hour	22.08	19.19	12.08
Knots run per ton of coal	0.743	1.238	2.478
Revolutions per minute	363.9	289.5	178.51

Double bottom and feed-water tanks are fitted under boilers. Peak tanks arranged for the carrying of fresh or salt water. Coal bunkers are abreast of boiler room and a cross bunker aft of boiler room. Drinking water tanks contain 4,000-gallons of fresh water and gravity tank 500-gallons. Refrigerator space has capacity of 550 cu. ft.

Propelling machinery is placed amidships and consists of two single-ended Scotch boilers, arranged fore-and-aft, with fireroom between the two. They are 16 ft. in diameter and 11 ft. between heads, working pressure 200 lbs. Engine is of the vertical, inverted - cylinder, triple - expansion, surface-condensing type, of about 1,800 H. P., with cylinders 19¾, 31½ and 54¼-in. diameter, respectively, with a common stroke of 63-in.

New Service to South America

The Mississippi Valley, South America & Orient Steamship Co., 806 Gravier street, New Orleans, La., has been organized to establish a monthly service between gulf ports and South America. It has chartered the freighter Inkum, of 8,400 tons, and the vessel left New Orleans with a full cargo during the latter part of June. It is stated that the Inkum is the first general cargo carrier to sail from any gulf port to the east coast of South America since the civil war. James W. Porch, president of the company, says that it is the eventual intention of the company to operate a service under the American flag from the Mississippi valley through New Orleans, its natural gateway, to the east coast of South America. Gale Aiken Jr. is secretary of the new company, Walter J. Manion treasurer and R. J. Cobb traffic manager.

Leasing Seattle Public Wharves

The Seattle port commission, which since its inception and organization last December has been planning and making preliminary arrangements for a great scheme of harbor improvement, has closed its first lease for the use of public wharves. The lessee is the American-Hawaiian Steamship Co., which operates the largest fleet of ocen-going vessels flying the American flag. The commission's contract gives the steamship company the right to use for ten years, at an annual rental of $30,000, one-half of what is known as the East Waterway improvement.

In entering into this agreement the commission said in part in an authorized statement:

"This agreement is probably the most carefully prepared document of the kind ever drawn. It is free of every feature of monopoly characterizing the ordinary long-term lease. The term itself is the shortest which the law allows. The right is also reserved to require the company to give accommodations to other than its own vessels. Common use of the railroad tracks is obligatory. Statistics of business must be furnished. The question of rates is subject to control by the commission. In all minor details the rights of the public are effectually safeguarded and there is nothing in the contract to which the most ardent friend of public ownership can take exception.

"Another consideration which should not be overlooked is that this contract makes the property in question absolutely self-sustaining from the start. The increase of taxation to sustain the bond issues authorized last March has given the commission much anxious thought and it is seeking to reduce that burden as rapidly as possible. The arrangement just made is an absolute certainty so far as it goes. It will fully pay the interest and bond retirement from the moment it goes into effect and this relieves the taxpayers of that charge. This might result, it is true, under direct operation and probably would after a time, but this contract makes it a certainty from the start."

While there is a considerable public ownership sentiment in Seattle, the terms of the agreement with the American-Hawaiian line appear to safeguard the city's interests to such a degree that no opposition to this arrangement has appeared. This line makes its terminus at Seattle and does a large business to Puget Sound. Upon the opening of the canal it will operate through that waterway from the Atlantic coast, abandoning its present route via the Tehuantepec railroad. This company has increased its business to North Pacific ports by leaps and bounds during the last five years, and its present water terminals in this city are already greatly cramped, although they were

more than ample when the present lease was executed about five years ago.

It will be some time before the wharf which the A-H company will use will be ready as work has not yet been started on it. The site is well within the industrial limits of Seattle and it has excellent railroad connections. The improvement proposed on this site provides for the dredging of a slip 221.4 ft. in width eastward from the East Waterway and the construction of wharves and sheds on each side thereof. Each shed will have a ground floor area of 85,913 sq. ft. The frontage at the outer ends of the wharves and on the sides fronting on the slips will make desirable landing space for local and small coastwise vessels. The plan also provides a berthing length of 983 ft. on each side, making a total of 1,966 lineal feet of dockage in addition to approximately 600 lineal feet which may be devoted to local vessels. The sheds are to be supported on creosoted pile wharves and foundations. It is proposed to use creosoted timber and riprap or brush in the bulkheads and slopes. The estimated cost of this improvement, including land to be acquired by condemnation and providing a safe margin for other contingencies is $850,000. This improvement is but one of several planned for Seattle harbor, the total of which will be approximately $3,000,000.

Some Interesting Figures

Information as to the results of the further modification in the ships of the Erie Railroad Transit Line, referred to in THE MARINE REVIEW for January (p.9) is at hand and certainly makes interesting reading. The work was instituted by and carried out under the direction of Babcock & Penton, consulting engineers to the Erie railroad, and following upon the observations and experiments of the season of 1911, tabulated in THE REVIEW.

Ships C and E (see table, p.9) were selected for attention during the winter, and as a result of the alterations C's fuel consumption has been further reduced from 191 tons per trip for 1911 to 145 tons per trip in 1912, a reduction of 24 per cent, or of 29 per cent as compared with 1910. A further increase in speed of 0.75 mile per hour has also accrued from the increase in revolutions due entirely to the modifications in steam distribution, the engines being worked for all ordinary service at shortest possible cut-offs. No changes whatever were made in the boiler plant in this case, although plans are under consideration for certain alterations next winter.

Ship E's fuel has been further reduced from 230 tons per trip for 1911 to 165 tons in 1912, a reduction of 29 per cent, or of 36 per cent as compared with 1910. Even more remarkable is the increase of 1.75 miles per hour in speed in spite of a reduction of 20 per cent in the minimum cut-off, at which the engines have been steadily worked. The increase in revolutions has been about nine per minute and is due entirely to improved valve design and steam distribution, the working steam pressure being unaltered. Since the resultant speed is too high for average service the only way it can be reduced is by lowering the boiler pressure or by throttling, a condition which it is perfectly safe to say will be regarded as unusual, to say the least.

The ship has steamed from Buffalo to Cleveland, over 180 miles, at better than 11 miles per hour with less than half boiler capacity in service, the remaining fires being worked with an air pressure of only about ⅛ inch at the ashpits. No attempt was made to get higher speed, the ship not being required to be in Cleveland before 7 a. m. The reduction in bunker capacity has also added directly about 50 tons of cargo space between decks, an item of considerable value in handling package freight.

Ship D has further reduced her fuel consumption about 15 tons, an overall reduction of 32 per cent as compared with 1910.

The coal and personnel are the same as during the season of 1911 with the exception of one change in the latter.

THE REVIEW hopes to present further data, including the other ships of the fleet, later. Meantime it may be noted once more that both C, E and D are modern steel ships with high grade machinery, having no radical defects of design or construction and their work was certainly not inferior to the average of similar ships.

The line has added a fuel lighter and coal dock facilities to its equipment and now handles its own fuel. The lighter carries 100 two-ton buckets and a McMyler hoist.

Isherwood Patent Granted

J. W. Isherwood, on June 11, was granted a patent on his system of longitudinal ship construction by the United States patent office. Eight vessels have already been built in this country upon this system, four at Newport News, one at Baltimore, one at the Ecorse yard of the Great Lakes Engineering Works, at Detroit, and two at the Lorain yard of the American Ship Building Co. The following ship yards have under way or under order vessels for construction under this system: Fore River Ship Building Co., Quincy, Mass., 1; New York Ship Building Co., Camden, N. J., 1; Wm. Cramp & Sons Ship & Engine Building Co., Philadelphia, 1; John H. Dialogue & Son, Camden, N. J., 3; Maryland Steel Co., Sparrow's Point, Md., 12; Newport News Ship Building & Dry Dock Co., Newport News, Va., 3; James Rees & Sons Co., Pittsburgh, Pa., 3; American Ship Building Co., Cleveland, 12; and Western Ship Building & Dry Dock Co., Port Arthur, Ont., 3. The American Ship Building Co. is the licensee of this patent for the great lakes.

Contract for Bulk Freighter

The Pittsburgh Steamship Co. gave contract to the American Ship Building Co. during the month for a 600-ft. steamer, being the third that it has under construction for 1913 delivery. This steamer will be built on the Isherwood system of construction and will be 600 ft. over all, 580 ft. keel, 58 ft. beam and 32 ft. deep, and will be built at the Lorain yard.

Following his practice of enlarging the average carrying capacity of the fleet, President Harry Coulby has disposed of three of the smaller vessels, the steamers Maruba and Corsica and the barge Malta.

The council of the Society of Naval Architects and Marine Engineers has elected the following vice presidents and members of council to fill existing vacancies: Vice presidents: Capt. A. P. Niblack, vice Rear Admiral Evans (deceased), George W. Dickie, vice Rear Admiral Melville (deceased); members of council: Commodore L. H. Chandler, vice George W. Dickie (promoted), Capt. C. A. McAllister, vice W. A. Post (deceased); associate members of council: Henry S. Grove, vice Capt. A. B. Niblack (promoted).

The Montreal Dry Dock & Ship Repairing Co. has just been incorporated with a capital of $50,000. The officers are J. T. Walsh, president; A. Larocque, vice president; F. H. Fox, secretary and treasurer; Thomas Hall, managing director. The company has secured a ten-year lease on the Tate dry dock on the Lachine canal.

Capt. J. J. H. Brown Passes Away

Capt. J. J. H. Brown, former president of the Lake Carriers' Association, died at Buffalo on June 11. He had been a conspicuous figure in lake circles for the past 50 years. He was born in Cleveland on Feb. 9, 1838. He was attracted to the sea at the early age of 14, sailing around the world in merchant vessels and whalers. He returned to the lakes when he was 20 and began sailing on lake ships. In 1873 he was appointed master of the Scotia, at that time the largest schooner on the lakes. In 1878 he entered into partnership with Capt. Daniel Rogers as vessel agents. On the death of Capt. Rogers, in 1885, he became associated in the same business with Edward Smith, under the firm name of Brown & Co. Capt. Brown was elected

CAPT. J. J. H. BROWN

president of the Lake Carriers' Association in 1896 and was chosen president of the Buffalo chamber of commerce in 1904. At the time of his death he was a member of the executive committee of the Lake Carriers' Association. His funeral was largely attended by vessel owners from all over the lakes and all the vessels enrolled in the Lake Carriers' Association fleet carried flags at half mast.

The Year's Ship Building

During the year ended June 30, 1912, there were built in the United States and officially numbered by the Bureau of Navigation, 1,702 merchant vessels of 243,792 gross tons, compared with 1,208 of 302,158 gross tons for the same period of 1911, showing a loss of 58,366 tons.

Of the 35 metal vessels built on the great lakes, the Col. James M. Schoonmaker and William P. Snyder Jr., each of 8,603 gross tons, are the largest on the lakes. Fourteen others of 30,029 were built for the Atlantic trade.

Over 50,000 gross tons of sailing vessels were lost at sea during the year, equivalent in tonnage to vessels built of this class for the last three years. Following is the summary:

	Wood						Steel						Total	
	Sail.		Steam.		Unrigged.		Sail.		Steam.		Unrigged.			
	No.	Gross.	No.	Gross.	No.	Gross.	No.	Gross.	No.	Gross.	No.	Gross.	No.	Gross.
Atlantic and Gulf	75	14,818	410	15,448	118	30,692	3	2,040	33	39,682	13	7,765	652	110,445
Porto Rico	4	65	2	30	...	.....	.	.....	..	.....	..	.....	6	95
Pacific	10	1,158	333	15.088	161	14,247	.	.....	10	3,658	..	.....	514	34,151
Hawaii	..	.....	...	.....	...	.....				.....	..	.....	...	.....
Great Lakes	4	38	261	3,919	64	6,013	2	4,057	31	79,223	2	1,308	364	94,558
Western rivers	.	.....	151	3,779	26	410	.	.....	7	354	.	.....	184	4,543
Total	93	16,079	1,157	38,264	369	51 362	5	6,097	81	122,917	15	9,073	1,720	243,792

During the corresponding year ended June 30, 1911, 1,208 sailing, steam and unrigged vessels of 257,938 gross tons were built in the United States and officially numbered, as follows:

	Wood						Steel						Total	
	Sail.		Steam.		Unrigged.		Sail.		Steam.		Unrigged.			
	No.	Gross.	No.	Gross.	No.	Gross.	No.	Gross.	No.	Gross.	No.	Gross.	No.	Gross.
Atlantic and Gulf	65	8,156	432	18,990	90	25,907	4	2,208	66	114,581	7	2,138	664	171,980
Porto Rico	6	156	3	26	..	.....	.	.....	..	.....	.	.....	9	182
Pacific	8	823	277	9,372	133	7,020	.	.....	9	12,392	.	.....	427	29,607
Hawaii	.	.....	1	22	...	.....	.	.....	..	.....	.	.....	1	22
Great Lakes	2	55	142	2,467	48	7,307	.	.....	44	83,134	4	1,409	240	94.372
Western rivers	.	.....	146	4,375	36	439	.	.....	3	1,181	.	.....	185	5,995
Total	81	9.190	1,001	35.252	307	40,673	4	2,208	122	211,288	11	3.547	1,526	302,158

Fishing Steamer Frank Perry

Lake marine men will hardly recognize the accompanying photograph as that of the large tug Frank Perry, formerly located at Sault Ste. Marie, Mich. The Perry was purchased last winter by the Southern Menhaden Co., of Jacksonville, Fla., and was taken to Manitowoc at the opening of navigation, where the Manitowoc Ship Building & Dry Dock Co. cut her down to the main deck and reconstructed her to be adapted to the fishing business.

The work included new surface condenser and a general overhauling of the engine room for salt water purposes, new quarters for the crew, a 75-ft. spar, arrangements in the hold for the carrying of fish, new houses and general repairs and alterations to make the boat suitable for the fishing business. The alterations cost about $16,000 and make the Perry one of the most complete and modern fishing steamers on the Atlantic coast.

The menhaden or pogie is a fish caught for its oil and the residue after pressing is used for fertilizer. The fishing grounds extend from Maine to Florida. The Perry left for the coast June 29.

Bids for Gunboat

The Seattle Construction & Dry Dock Co., Seattle, Wash., was the only bidder for the construction of the river gunboat Monacacy, of 190 tons displacement. The company offered to build this boat for $212,000, or deliver it on board steamer at San Francisco for $214,500, or at Shanghai, China, for $290,000. The appropriation for the gunboat was $215,000. The navy department rejected the bids on the ground that the bids

FISHING STEAMER FRANK PERRY
REMODELED BY THE MANITOWOC SHIP BUILDING & DRY DOCK CO.

actually within the amount of the appropriation did not leave sufficient margin to defray other necessary expenses. The navy department thereupon accepted the bid of the Mare Island navy yard at $141,000. The Seattle Construction & Dry Dock Co. has protested against this proceeding, claiming that the gunboat cannot be built for $141,000 and that this estimate should not be considered in competition with the bid of a private ship builder. The matter has been placed before President Taft, who is now giving it consideration.

Matson Life Raft

A life raft designed by H. J. Matson was recently tested out on the battleship Rivadavia, building at the yard of the Fore River Ship Building Co., Quincy, Mass., the navy department being represented by Naval Constructor Lloyd Bankson. The Matson raft is constructed of galvanized iron and has 12 watertight compartments. It is 12 ft. long, 9 ft. wide and 3 ft. high and will carry 65 persons. The accompanying cut

THE MATSON LIFE RAFT

shows its general features of construction. At each end of the raft there is a tank, one for provisions and the other to hold enough water to sustain 65 persons for eight days. The water tank is equipped with what the inventor calls a "sucking tube." This device obviates the necessity of a bunghole and prevents the inflow of any salt water into the tank. Around the entire raft is a life line and inside are five oars and provision for rigging a sail. The top and bottom of the raft are composed of slats and, whichever way the boat lands, a simple removal of a pin will release the slats on the top. On board the liner the raft rests on a launching gear and at an angle of about 45 deg. It is set on wheels to enable it to be put overboard with the greatest possible dispatch. The launching gear is extremely simple. Heavy iron chains hold it in place, but a slight pull on a lever will release the raft and send it bounding into the sea—once in the water it immediately rights itself and passengers reach it by means of a rope attached to the steamer. Mr. Matson has perfected his launching device by stringing the rafts along in series so that one man by releasing one lever can launch four rafts, all within a few seconds. There are no pulleys, ropes or davits and the raft takes up very little room on deck. It is reported that the French line has adopted the raft as a part of its equipment.

Ordered to Take Back Steamers

Judge William L. Day, in the United States circuit court, Cleveland, last month ordered the American Ship Building Co. to take back the steamers J. Q. Riddle, Abraham Stearn and Sheldon Parks from the Commonwealth Steamship Co., and to restore to the company the money that was paid to them, approximately $1,265,000. The decision was quite a surprise to the trade but Judge Day held that the American Ship Building Co. had been guilty of fraud in granting secret commissions to W. A. and A. H. Hawgood for placing contracts for these steamers. Litigation in the case has been long. It was originally started by Frank P. Whitney, a stockholder in the Commonwealth Steamship Co., who brought suit against the Hawgoods, making the Commonwealth Steamship Co. party defendant. The Hawgoods refused to answer any questions until the common pleas court ruled that they should do so, when they testified that they had received the following commissions upon steamers constructed for the Commonwealth Steamship Co.; A. H. Hawgood, $30,000; W. R. Woodford, $30,000; Sheldon Parks, $25,000; W. A. Hawgood, $25,000; Abraham Stearn, $15,000; and J. Q. Riddle, $5,000. The construction of the seventh vessel of the fleet, the H. A. Hawgood, had been promoted by Henry A. Hawgood, deceased, and no testimony upon her was submitted.

Immediately upon this confession, the suit against the Hawgoods was withdrawn and a suit against the American Ship Building Co. substituted to compel it to take back the steamers. Meanwhile four of the steamers, the W. R. Woodford, A. H. Hawgood, Henry A. Hawgood and Wm. A. Hawgood, had been sold, and in behalf of these four steamers the company seeks to recover the difference between the contract and the selling price.

Judge Day, in his decision, directed the American Ship Building Co. to pay the contract price of the three steamers left in the fleet of the Commonwealth Steamship Co., together with interest dating from the time contracts were made about five years ago. The Steamship company on its part is directed to pay to the builders the new profits of the operation of the vessels since they were built.

The Acme Transit Co., also a Hawgood corporation, has a similar suit pending against the American Ship Building Co. to require it to take back the steamers Edwin F. Holmes and H. B. Smith. The Hawgoods testified that they had received commissions of $17,500 on the Holmes and $15,000 on the Smith.

Eckliff Boiler Circulator

The Detroit, Belle Isle & Windsor Ferry Co. has installed the Eckliff automatic boiler circulator on five of their steamers and it is stated has had notable success with the Brittania, which is equipped with two Scotch boilers. The engineer states that within two hours from the time these five were put in the boiler he had 175 lb. of steam and that the temperature at the bottom of the boiler varied from 360 to 368 deg. Moreover, while formerly it was difficult to obtain sufficient steam to turn the engine 120 revolutions it is possible now to get 135 revolutions. The Eckliff circulator is of the thermo-syphon principle and is not dependent upon valves, injectors, tubes or other mechanical attachment, being governed entirely by the law of gravitation.

PERSONAL

Charles A. Moore, president of the Manning, Maxwell & Moore Co., and for many years president of the American Protective Tariff League, recently returned from Europe.

M. Seckendorf, general passenger agent of the New York & Porto Rico Steamship Co., has also assumed the duties of general passenger agent of the Clyde Santo Domingo line.

John S. Hyde, president of the Bath Iron Works, has accepted the vice presidency of the Maine Health Day Association, organized permanently to fight tuberculosis.

Frank W. Hibbs, former naval constructor, who represented the Electric Boat Co. at Seattle for several years, has been succeeded by T. S. Bailey, the Pacific coast manager of the company.

Ernest M. Bull, of A. H. Bull & Co., thinks that valuable aid could be given to the American merchant marine by conserving the business of carrying navy coal to the Philippines to American vessels.

W. D. Dickey, director and member of the executive committee of the Maritime Exchange, of New York, was recently presented with a loving cup for his services in rearranging the floor of the exchange.

Henry Harland, nephew of the late Sir Edward Harland, has been appointed head of the designing department of Harland & Wolff through the vacancy created by the death of Thomas Andrews in the Titanic disaster.

George W. Dickie, the well known ship designer of San Francisco, will be located at the yard of the New York Ship Building Co., Camden, N. J., for the next year superintending the building of ships for the Pacific Coast Co.

William I. Donnelly, consulting engineer, 17 Battery place, New York, has returned from an extensive trip to the Pacific coast and expresses himself as much impressed with the rapid progress made in the use of oil fuel there during the past year.

Arthur J. Grymes has been appointed manager of the marine department of the Erie railroad and will have charge of the company's fleet in New York harbor and the Hudson river as far as Troy, as well as of the fleet of coal barges and tugs which go as far east as Portland.

A. B. Pouch, vice president of the American Dock Terminal, Tompkinsville, N. Y., has sailed for England to confer with steamship owners who are reported to have interested themselves in an extensive project to develop the waterfront at Tompkinsville.

Capt. S. G. S. MacNeil has been appointed staff captain of the Mauretania and Capt. J. F. Simpson staff captain of the Lusitania, of the Cunard Line, in charge of discipline of crew, in order that the captain of the ship may give his undivided attention to the navigation of the vessel.

Thomas Long, vice president of the Collingwood Ship Building Co., in a recent speech urged the Dominion government to give Canadian yards protection against the unequal competition of British yards which are supplying a number of vessels for Canadian trade.

Col. Harris Weinstock, of San Francisco, in a speech before the chamber of commerce of that city, recently said that the rapid progress upon the Panama canal was due to the extreme loyalty of every worker, from the humblest to the highest, to Col. Goethals, who has carried on the great work without friction.

Julius Thomann, director of the Hamburg-American Line, announced just prior to returning to Hamburg that a provisional arrangement had been made whereby the company had executed a power of attorney in favor of J. P. Meyer, W. G. Sickel and Emil Lederer for the conduct of its business in this country, the joint signature of any two of these gentlemen to be binding.

William E. Woodall & Co., Baltimore, have launched a large pocket scow, 90 ft. long, 28 ft. beam and 9 ft. deep, for the Maryland Dredging & Contracting Co.

The Breakwater Co., of Philadelphia, has contracted with the Green Point Construction Co., of New York, for a tug to be 75 ft. long, for use in the harbor of Hilo, Hawaiian Islands.

Sir William White on Titanic Disaster

Sir William H. White, the eminent naval architect, in a letter to the London *Times* on the loss of the Titanic, says that the inquiry in America has been conducted in a manner which has justly given cause for serious criticism, but it has placed on record a mass of testimony of great value. The writer then sets out conclusions arrived at on the evidence available. In accordance with the practice adopted by the White Star line on her maiden voyages the rate of revolutions for her engines and the speed of the Titanic had been greatly increased during the outward passage.

The force of the blow which could be struck by the ship was equal to that struck by the weight of 1,000 tons falling through a vertical height of 1,000 feet. The total energy was as great as that represented by the simultaneous discharge of a dozen of the largest and most powerful guns mounted in the most recent battleships. If the Titanic had struck the iceberg end on and been stopped, this vast store of energy would have been to a great extent absorbed in the mechanical work done in injuring and deforming her own structure and in shattering portions of the iceberg. It is certain that the ship only grazed the starboard side at a considerable depth below water.

It is natural to find a lack of exact observations or records by witnesses of the time or distance of striking. Twenty to 30 seconds would suffice to put the helm hard over, and 30 seconds more would be ample for the officer of the watch to receive a message from the look-out, so that one minute elapsed between the warning and the collision, in which time the Titanic would traverse 2,200 feet, and the iceberg would have been reported by the look-out at less than four-tenths of a sea mile ahead of the ship. The graze of projecting underwater portions of the iceberg destroyed the water-tightness of the shell plating for 250 feet from the stem, and threw open the five foremost watertight compartments.

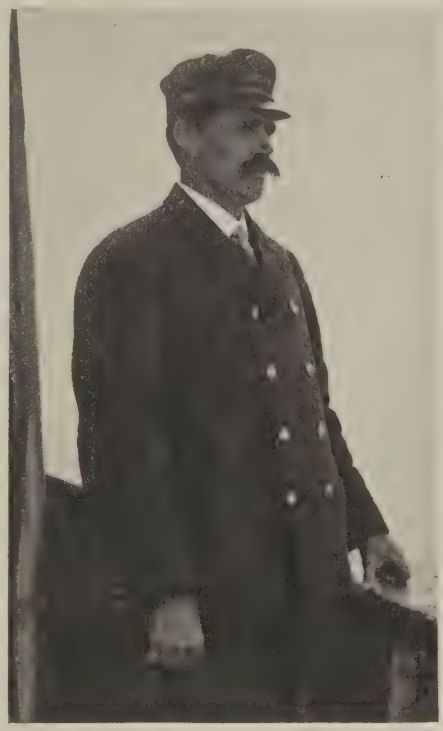
The rent in the ship's side must have been about 35 feet below the water surface, and the water would enter at 40 feet per second, so that one ton of water per second would have entered through each square foot of the area of the apertures, and thus 12,000 tons of water could enter in the first minute with free entry. The passengers and others on the decks

could have had no sense of danger from the slow sinkage of the bow. The stories of the ship having broken in two are incredible. It was a grazing blow which caused the fatal damage, and which practically destroyed the vessel by the injuries inflicted in a few seconds as a consequence of her high speed at the moment she struck the iceberg.

When the temporary excitement has disappeared it will be seen that the question of boat equipment must be treated as subordinate to that of efficient water-tight sub-division. Possibly ship owners will concur in action by which sub-division shall be made the subject of legislation on lines to be agreed upon by the board of trade and themselves. In view of the experience in connection with legislation for load-lines, it may be hoped that such action, if taken, may be of an international character.

Death of Capt. Sayre

In the death of Capt. C. E. Sayre the lakes lost one of its most experienced navigators. He was one of the most consistent students of the theory of navigation and his library on the subject was probably the most complete of any master in active service. He did not turn his attention to the lakes until he was 24 years of age, but ever since then he had been a consistent student of the science of navigation. He was born on a farm near Mason, Mich., Oct. 11, 1864, and was the son of Anglo-American parentage, his ancestors being New England settlers of colonial times. He worked on a farm until he was 17 years of age and then followed the carpenter and joiner trade, qualifying himself meanwhile as teacher of a district school of Ingham Co., Mich. At that time a family well known in lake navigation circles was living at Mason, and it was the incentive of this family which prompted him to change his vocation and become a sailor. Accordingly, with no knowledge whatever of the water, he went to Chicago in the spring of 1888 and shipped as deck hand on a lumber barge, subsequently serving as fireman, watchman and wheelsman in package freight and ore-carrying steamers. In 1892 he was appointed second mate of the steamer Pontiac and in 1893 went as first mate on the steamer Hesper. In the spring of 1897 he was appointed master of the steamer I. J. Boyce, entering the steel rail trade under the management of J. S. Keefe, in whose employ he remained the following year as master of the steamer Adella Shores. In 1899 he had command of the steamer Jessie H. Farwell, then under charter of the American Steel & Wire Co., with W. C. Richardson as manager. During the winter of 1900 he entered the employ of the Cleveland-Cliffs Iron Co., as master of the steamer Andaste, sailing her for five years. In 1905 he was transferred to the Centurion. He then brought out the Ishpeming, in 1906, sailing her for two years, after which he



CAPT. C. E. SAYRE

entered the employ of the Frontier Steamship Co., sailing the steamer Josiah G. Munro. He went in the Ontario, of the Northern Lakes Steamship Co., in 1911, and was sailing this steamer at the time of his death.

His death was extremely sudden and tragic. The Ontario was unloading coal at Milwaukee, on June 27, when the captain, apparently in the best of health and vigor, was seized with hemorrhage of the lungs, expiring in his cabin a few minutes later.

Floating Dock for British Admiralty

A gigantic floating dock has just left the Wallsend ship yard of Messrs. Swan, Hunter & Wigham Richardson, in charge of four powerful tugs, and is now on its way to the river Medway. The towing arrangements were in the hands of Messrs. L. Smit & Co., of Rotterdam. The dock is the third that Messrs. Swan, Hunter & Wigham Richardson have completed this year for the British admiralty. It may be remembered that some years ago they built another battleship floating dock with a lifting capacity of 17,000 tons which is now stationed at Bermuda. Other well-known floating docks have been constructed at the Wallsend ship yard for the governments of Southern Nigeria, Natal, Japan and Spain; and also for numerous British and foreign clients in various parts of the world.

This new floating dock, which is to be stationed in the river Medway, is quite the most complete of its kind and is intended for repairing and overhauling battleships with displacements up to 32,000 tons. A good idea of the size of the dock may be gained when it is known that it covers an area of two and a quarter acres. It is double-sided and the overall dimensions are 680 ft. in length with a width of 144 ft. The height of the walls is 66 ft. and the depth of the pontoons is about 20 ft. The weight of steel plates and angles worked into the dock is about 12,000 tons, and this, of course, is exclusive of all machinery and outfit.

At the bow end of the dock there is a pair of pivoted flying gangways to give access from one wall to the other. In the port wall of the dock is installed living accommodation for the dock crew. At each end of the two walls there are two steam boilers, making eight in all, which have been built at the Neptune Works of Messrs. Swan, Hunter & Wigham Richardson. Steam driven pumps of the centrifugal type which control the lifting of the dock, supplied by Messrs. Gwynnes, of Hammersmith, are placed at the base of the side walls.

At the end of one of the side walls is situated the valve house. From here, by means of electric pneumatic valve control gear, water level indicators and a complete telephone system to all parts of the dock, the dockmaster can take complete control. On the top of each wall there is a five-ton electric traveling crane and four powerful steam capstans to warp ships into the dock. The spaces in the interior of the walls are lit electrically while the outside of the dock is illuminated at night by large arc lamps and portable lamp clusters. In one of the walls of the dock large and well equipped workshops comprising a forge, machine shops and fitting shops, are installed. A complete electric generating plant is installed in each wall, which supplies current for lighting and ventilating the dock and the battleship which may be in the dock. The dock is, therefore, self-contained and will represent an addition to the navy of great importance.

June Ore Shipments.

Ore shipments during June were 7,567,555 gross tons, which is an increase of 2,747,559 gross tons over June, 1911, and also an increase of 250,963 tons over the movement of June, 1910, which was the record movement for an early month. Shipments to July 1, 1912, total 13,690,671 tons, which is only 1,227,587 tons less than the movement to July 1, 1910, when the record movement for the year was made. It is the expectation that the 1910 movement will be rapidly overtaken and the year 1912, notwithstanding the fact that it is a presidential year, will be a record-breaker. Shipments by ports were as follows:

	To July 1, 1911.	To July 1, 1912.
EAST BOUND.		
Copper, net tons	38,181	30,689
Grain, bushels	10,430,087	18,666,378
Building stone, net tons	1,352	2,282
Flour, barrels	1,717,918	2,028,112
Iron ore, net tons	8,241,337	12,925,044
Pig iron, net tons	10,088	.....
Lumber, M. ft. B. M.	159,321	178,695
Wheat, bushels	22,438,516	47,680,158
Unclassified freight, net tons	27,661	73,930
Passengers, number	6,885	5,994
WEST BOUND.		
Coal, anthracite, net tons	520,000	224,908
Coal, bituminous, net tons	3,689,282	3,715,397
Flour, barrels	125	.....
Grain, bushels	.....	.....
Manufactured iron, net tons	118,060	197,811
Iron ore net tons	9,486	3,188
Salt, barrels	236,477	295,687
Unclassified freight, net tons	397,598	336,050
Passengers, number	8,655	7,197
SUMMARY OF TOTAL MOVEMENT		
East bound, tons	9,624,131	15,329,385
West bound, tons	4,769,561	4,521,385
	14,393,692	19,850,770
Vessel passages	5,214	6,783
Registered tonnage, net	11,470,473	16,395,913

Lake Erie Ore Receipts.

Out of a total movement of 7,567,555 tons of iron ore during June, 5,816,493 tons came to Lake Erie ports, distributed as follows:

Port.	June, 1912.
Buffalo	687,283
Erie	41,124
Conneaut	1,419,562
Ashtabula	1,202,135
Fairport	283,520
Cleveland	1,201,475
Lorain	630,134
Huron	94,161
Sandusky	.....
Toledo	158,572
Detroit	98,727
Total	5,816,493

J & L Chain Catalogue

The Jones & Laughlin Steel Co. has certainly reached high water in the production of its new catalog on chains and attachments. It is a work of art in printing and binding and as such will undoubtedly be preserved for its workmanship. It is bound in russet leather, printed on fine stock with gilt edges. The illustrations are in double tint, showing in picturesque fashion the making and testing of chains. The chapter headings, beautifully designed, are printed in three colors. In illustrating the various grades of chain a new departure is noticed in the showing of several sizes of each style of chain, thus giving a sense of comparison and also in extending the illustrations to the page margins. One chapter is devoted to the care of chains, one to testing and inspecting J. & L. chains, and others to hand and machine chains and data concerning chains.

The Modern Boiler Tube

The National Tube Co., Pittsburgh, Pa., has just sent to the trade its booklet entitled "The Modern Boiler Tube." The booklet is a story of the evolution and development of the boiler tube. As known the company devotes its entire attention in the boiler tube line to the manufacture of steel tubes, both lap-welded and seamless. Specifications are published for these tubes for both merchant and marine service, including National Tube Co.'s specifications, American Society for Testing Materials and the full report of the special committee on steel vs. iron flues read before the International Master Boiler Makers' Association at its 1909 and 1910 conventions.

Commerce of Lake Superior

During June 10,747,159 net tons of freight passed through the canals at Sault Ste. Marie, an increase of 1,810,466 tons over the May movement. The movement marks a most substantial increase over that of 1911, when 7,476,087 tons were moved. The movement to July 1 was 19,850,770 tons as against 14,893,692 tons for the corresponding period last year, an increase of 4,957,078 tons. Following is the summary:

Port.	June, 1911.	June, 1912.
Escanaba	538,168	849,059
Marquette	314,807	561,976
Ashland	394,555	811,029
Superior	1,629,112*	2,348,608
Duluth	1,102,979	1,551,214
Two Harbors	840,345	1,445,669
Total	4,819,996*	7,567,555
1912 increase		2,747,559

Port.	To July 1, 1911.	To July 1, 1912.
Escanaba	1,067,708	1,641,948
Marquette	533,738	918,890
Ashland	662,412	1,332,891
Superior	2,944,954*	4,344,331
Duluth	2,050,134	2,845,478
Two Harbors	1,577,426	2,007,223
Total	8,836,372*	13,690,671
1912 increase		4,854,299

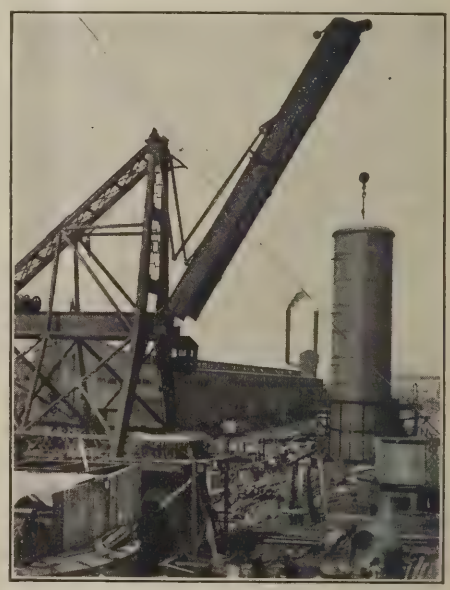
*Corrected.

The Fifth Monitor

Five vessels of the monitor type of construction will shortly be in commission, Osbourne, Graham & Co., Sunderland, England, having just launched one to be known as the Nervion, for Fearnley & Eger, of Christiana, Norway. Louis Zollner, managing director of the Monitor Shipping Corporation, declares that the monitor design, both scientifically and practically, held the field as the finest type afloat for carrying capacity, steadiness, economy and profit earning.

Lowering Rivadavia's Stack

The accompanying photograph shows the after stack of the battleship Rivadavia being lowered in place



LOWERING AFTER STACK RIVADAVIA

at the yard of the Fore River Ship Building Co., Quincy, Mass., on June 5. This stack is 58 ft. 4 in. long, 14 ft. 6 in. diameter and weighs 26 tons

The Niagara Navigation Co. and the St. Lawrence River Steamboat Co., which are now owned and operated by the Richelieu & Ontario Navigation Co., have elected the following officers: President, Sir Rodolphe Forget; vice president, William Wainwright; vice president, C. J. Smith; secretary, F. Percy Smith. C. J. Smith, as vice president and general manager, will have full charge of the property.

The Thousand Island Steamboat Co. has also elected Sir Rodolphe Forget as president, C. J. Smith as vice president, and F. Percy Smith as secretary, with C. J. Smith in general charge.

What It Is And What It Can Do

"Thermit" is a mixture of finely divided aluminum and iron oxide which when ignited burns up and produces liquid steel at a temperature of 5,400° F. This poured into a mold surrounding a broken section and owing to its intense heat dissolves the metal with which it comes in contact, amalgamating with it to form a homogeneous mass when cool.

It Welds

Broken Sternposts, Rudderposts, Rudder Frames and all other heavy wrought and steel sections. Very little dismantling is necessary.

¶ The welding is accomplished quickly, returning the vessel to service in a few days, saving a great deal of time and expense.

¶ Our pamphlet 25-E and "Reactions" are interesting to read. Send for them.

GOLDSCHMIDT THERMIT COMPANY
WILLIAM C. CUNTZ, Gen. Mgr.
90 West St, New York

432-436 Folsom St., San Francisco
103 Richmond St., W., Toronto, Ont.
7300 So. Chicago Ave., Chicago.

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Forged Steel Marine Water-Tube Boilers and Superheaters

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Highest Efficiency and Highest Capacity with Coal and Oil Fuel as proved on Tests by Boards of U. S. Naval Officers.

A majority of the World's Dreadnoughts are fitted with **Babcock & Wilcox Boilers.**

The largest dreadnoughts, "Moreno" and "Rivadavia,"
The fastest dreadnought, "Florida,"
The most economical dreadnought, "Delaware,"
are equipped with **Babcock & Wilcox Boilers.**

The largest power ever installed on shipboard will be 87,500 H. P. of Babcock & Wilcox Boilers in British Battle Cruiser "Tiger."

More than 2,000,000 H. P. in Naval Vessels.
Nearly 500,000 H. P. in Merchant Service.

High Efficiency Gives Low Stack Temperature
Every Part Readily Accessible for Cleaning
LIGHT SAFE ECONOMICAL

WORKS:
Bayonne, New Jersey — Barberton, Ohio
Renfrew, Scotland — Paris, France
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On a Bale of Oakum
INSURES QUALITY

Grades—Best, U S. Navy, and Navy, both Spun and Unspun.

Also Plumbers' Oakum and Spun Cotton.

Give us an opportunity to show you the quality of our goods.

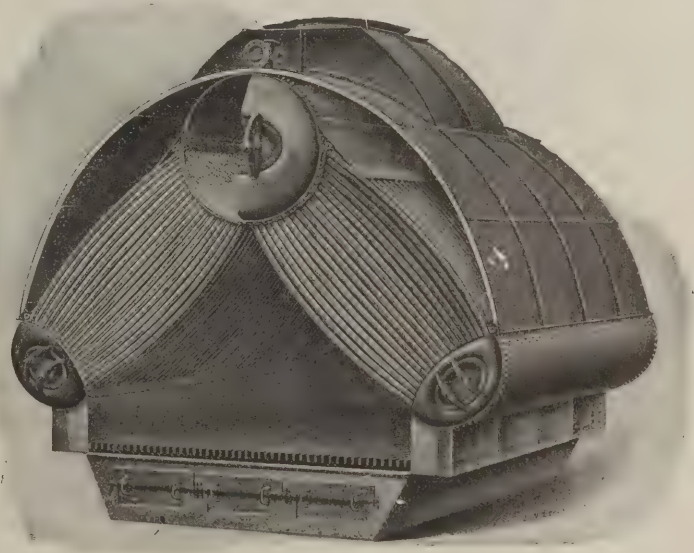
We were established in 1840, and for over 70 years have been doing a business that has been made possible only by "Square Dealing".

"Quality, First, Last, Always"
IS OUR MOTTO

Let us hear from you at once.

W. O. DAVEY & SONS
JERSEY CITY N.J.

Mosher Water Tube Boilers



Adapted for the highest grade service, Torpedo Boats, Destroyers, Battleships, and large commercial vessels. Steam drums up to six feet in diameter, larger water and steam room capacity than any other boiler.

Any tube can be replaced without disturbing any others. Fifty tubes removed through one hand-hole. Curvature of tubes just sufficient to avoid expansion troubles. Greatest facility for cleaning interior and exterior of tubes. No screwed joints, all tubes expanded. All parts of wrought steel. Send for catalogue.

MOSHER WATER TUBE BOILER CO.
30 Church Street, NEW YORK

Welin Davits

The ill-fated Titanic was fitted with Welin davits of the double-acting type and could have carried three times as many lifeboats as were actually on hand. As a matter of fact there were three boats under one set of davits, all three of which were successfully launched one after the other, as well as two boats under another set. The officers of the Titanic testified that owing to the list of the ship it would have been impossible to launch the boats on the high side without the modern davits. It is admitted by practical men that the Welin davit embraces features that are most important and desirable in launching apparatus, that is, to be able to swing a boat outboard with the passengers in their places under any conditions whether the ship is listed or upright or rolling; to be able to keep the boat close to the ship's side when lowering to prevent its being crushed in; to be able to arrange the falls so that the boat will land in the water horizontally no matter what the angle of the deck line may be; to be able to detach the boat instantly and push her away from the ship's side at once. Launching a lifeboat is a far more serious problem than the layman thinks, as a large lifeboat fully loaded may weight from six to 12 tons.

Much stress has been laid in uninformed quarters on the importance of having much clearance outboard for the davits, sufficient to prevent the boat from touching the ship's side. Obviously this would mean a clearance equal to the distance from the water line to the top of the davits, which on large liners would mean from 80 to 90 ft. Clearance is not as important as control when the boats are close to the ship's side. By having control of the boat as it is lowered, the ship's side helps to steady and support it on its downward way, and it is prevented from swinging out far enough that an onrushing wave could smash it against the side of the ship.

One objection made against the Welin davits by ship builders particularly is their weight as against the lightness of the decks of vessels of the lake and coast type. As a matter of fact the weights of the Welin davits are 10 per cent less than those of round bar davits for boats of the same capacity, and in most cases it will be found that the slight reinforcement necessary to take the Welin davits would not equal this difference in weight of the davits themselves. However, the proper thing to do would be to build the deck strong enough in the first place to take davits which would be of actual use when life boats are needed. Lifeboats are useless unless they can be safely and rapidly launched and the Welin davit appears to have solved this problem. Moreover, as it is possible for a single set of Welin davits to handle two and even three boats, there should be no difficulty in carrying lifeboat accommodations to meet all reasonable requirements.

The La Salle Machine & Tool Co., La Salle, Ill., are the agents for the Welin davits on the great lakes.

LUNDIN DECKED LIFEBOAT, WITH 60 PERSONS, UNDER THE WELIN DAVITS

The Cunard liner Carmania, which was the first Cunard steamer to be fitted with turbine engines and the success of which induced the Cunard Co. to adopt this form of propulsion for the Mauretania and Lusitania, was greatly damaged by fire at Liverpool. The fire raged for several hours before it was extinguished and practically destroyed the superstructure of the vessel. The Carmania is seven years old and until the advent of the express steamers, Mauretania and Lusitania, was the finest vessel in the Cunard service.

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CONTROLLED BY GRAVITY

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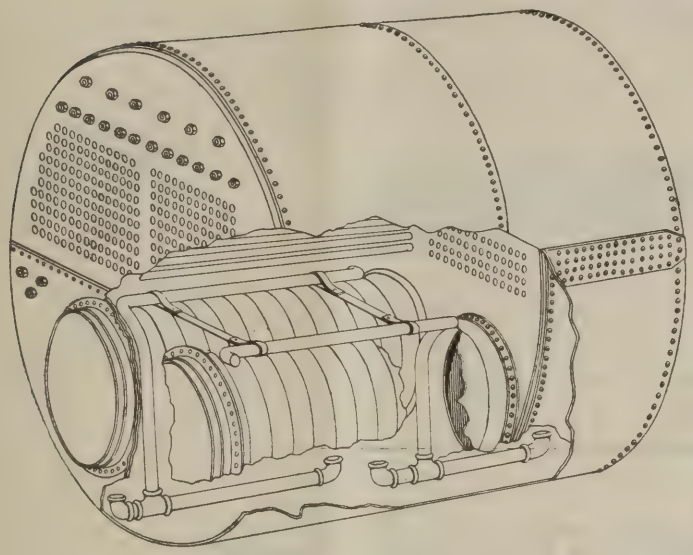

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Tested Thermometers Prove Heat at Bottom of Boilers

Reading from boiler on Steamer "BRITTANIA" of the Detroit, Belle Isle & Windsor Ferry Company.

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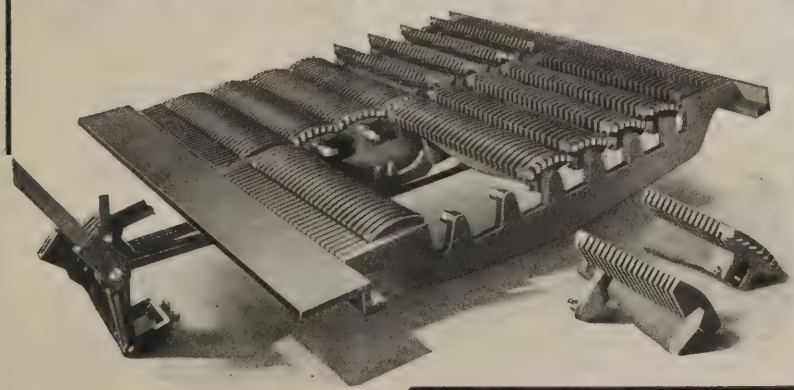

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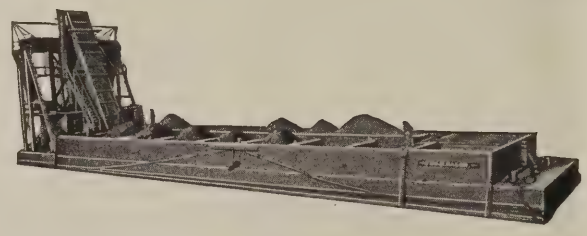

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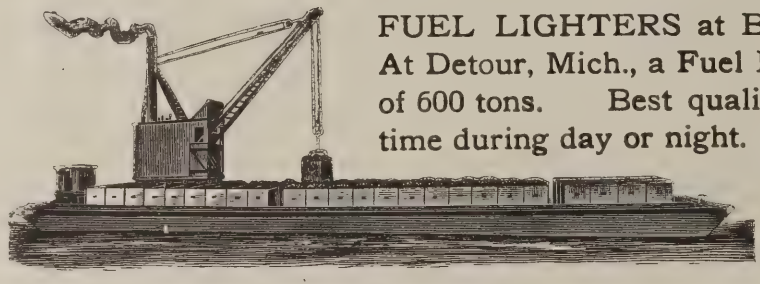

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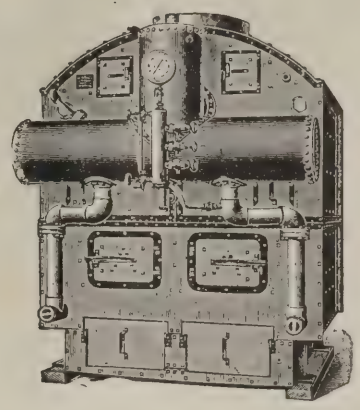

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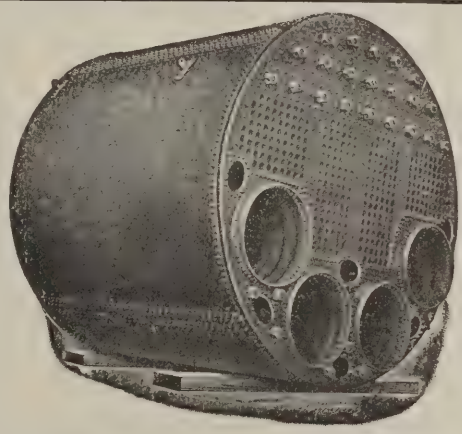

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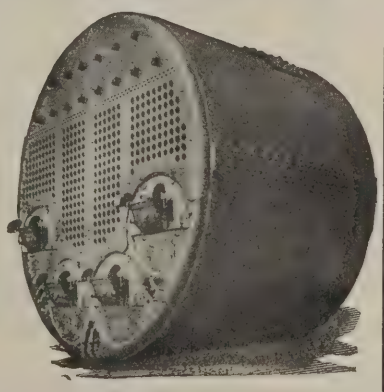

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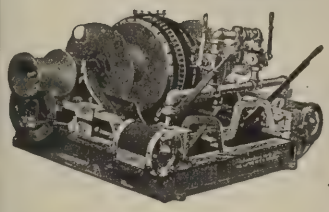

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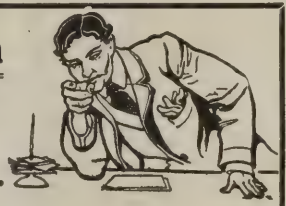

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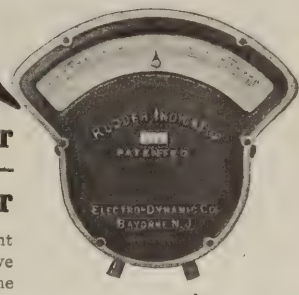

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Placed in pilot house or on bridge in front of quartermaster, allows him to observe the position of the rudder the same as he does the compass. Can be installed on vessels with or without lighting plant. Highly recommended wherever in use.

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Spend your vacation on the Great Lakes the most economical and enjoyable outing in America.

Daily service is operated between Detroit and Cleveland, Detroit and Buffalo; four trips weekly between Toledo, Detroit, Mackinac Island and way ports; daily service between Toledo, Cleveland and Put-in-Bay.

A Cleveland to Mackinac special steamer will be operated two trips weekly from June 15th to September 10th, stopping only at Detroit every trip and Goderich, Ont., every other trip.—**Special Day Trips Between Detroit and Cleveland, During July and August.—Railroad Tickets Available on Steamers.**

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Depth of Water.
Port and Pilotage Charges.
Officials.
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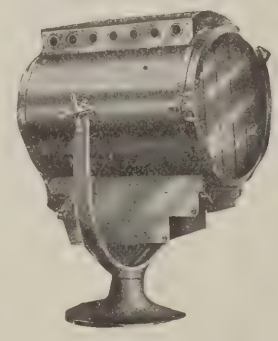

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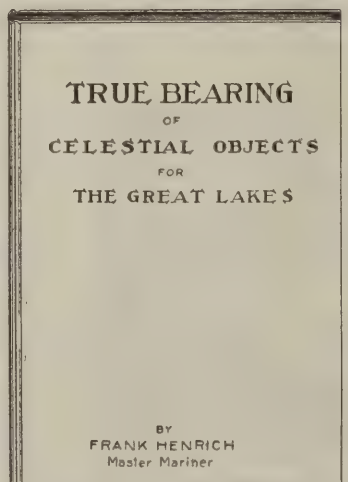

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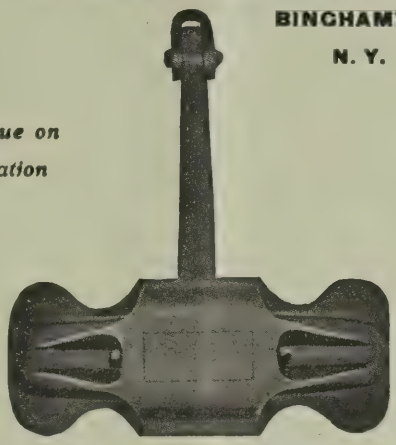

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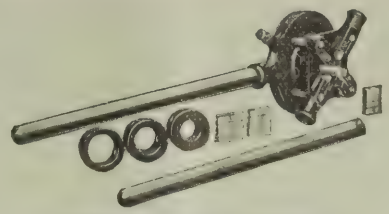

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Sullivan, M..... 93

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Dunbar & Sullivan Dredging Co..... 92
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Sullivan, M..... 93

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Superior Iron Works..... 81

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Lidgerwood Mfg. Co..... 85
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Sheriffs Mfg. Co..... 91
Superior Ship Building Co..... 6
Toledo Ship Building Co..... 4
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Lidgerwood Mfg. Co..... 85

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Detroit Ship Building Co..... 5
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American Engineering Co..... 2

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Ross Valve Mfg. Co..... 12

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Boston & Lockport Block Co..... 91

HOISTS.—(Air.)
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Boston & Lockport Block Co..... 91
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Dake Engine Co..... 11
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Lidgerwood Mfg. Co..... 85

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Dake Engine Co..... 11

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Electro-Dynamic Co. 85

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Ritchie, E. S., & Sons..... 91
Schuette Recording Compass Co..... 84

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Pickands, Mather & Co..... 82

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General Electric Co..... 21

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Safety Car Heating & Lighting Co..... 12

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General Electric Co..... 21

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Nicholson Ship Log Co..... 84
Schuette Recording Compass Co..... 84
Walker & Sons, Thomas..... 3

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Penberthy Injector Co..... 100

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Martin-Barriss Co. 18

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Bartlett, C. O., & Snow Co..... 84

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American Engineering Co..... 2
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Tietjen & Lang Dry Dock Co..... 10
Toledo Ship Building Co..... 4

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National Tube Co..... 13

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Michigan Salt Works..... 100

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Starke Dredge & Dock Co., C. H..... 92
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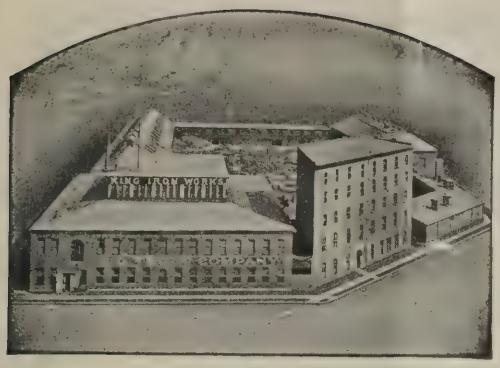

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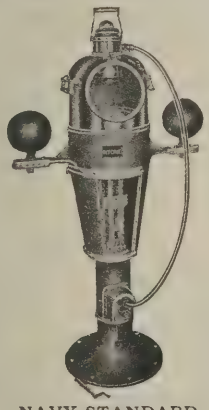

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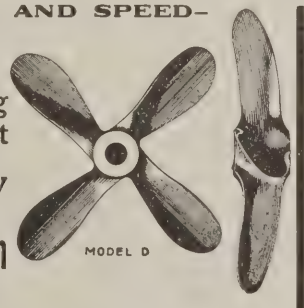

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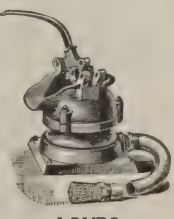

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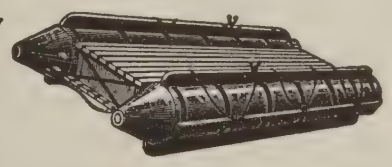

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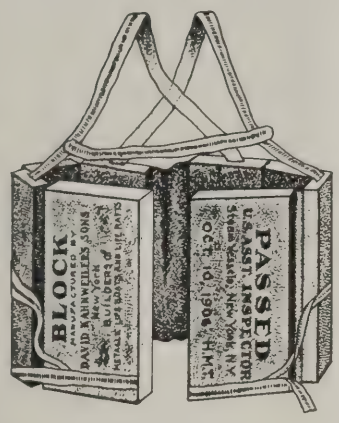

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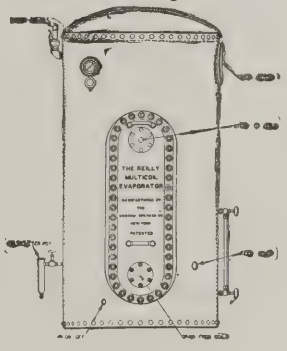

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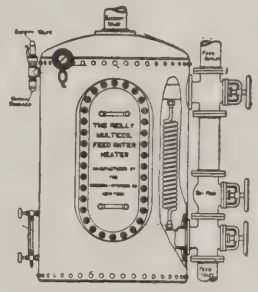

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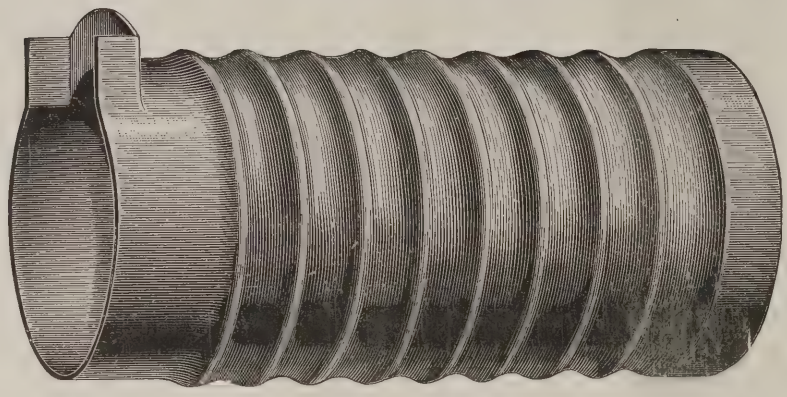

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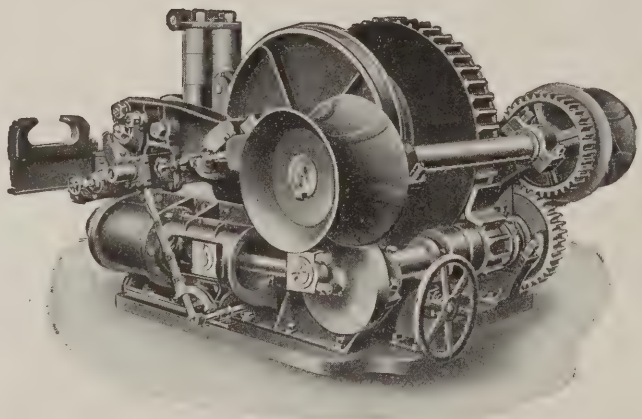

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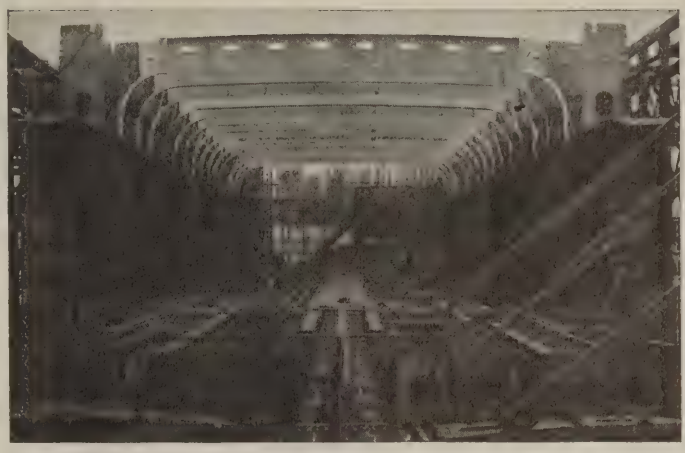

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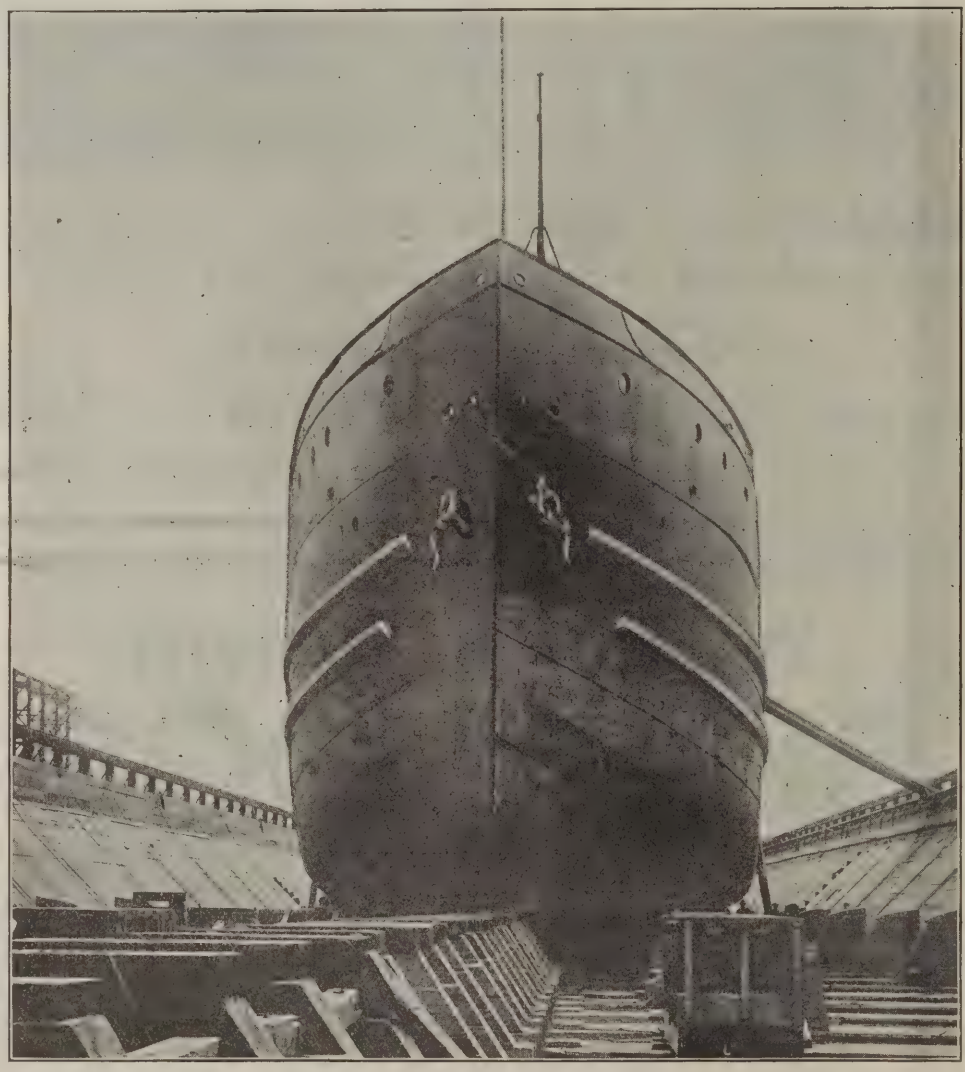

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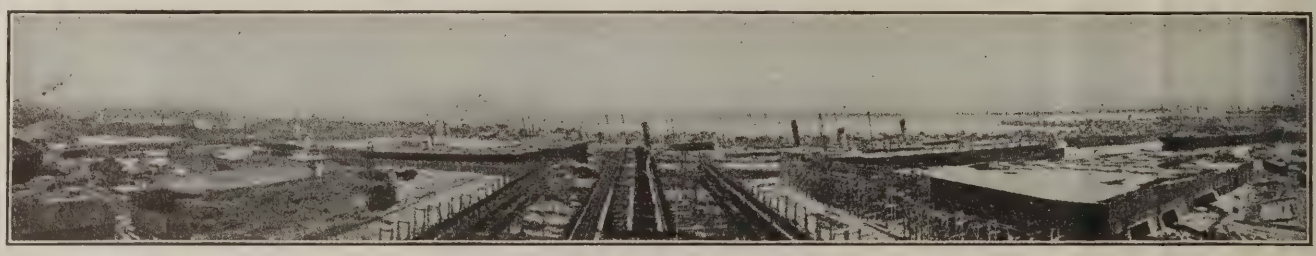

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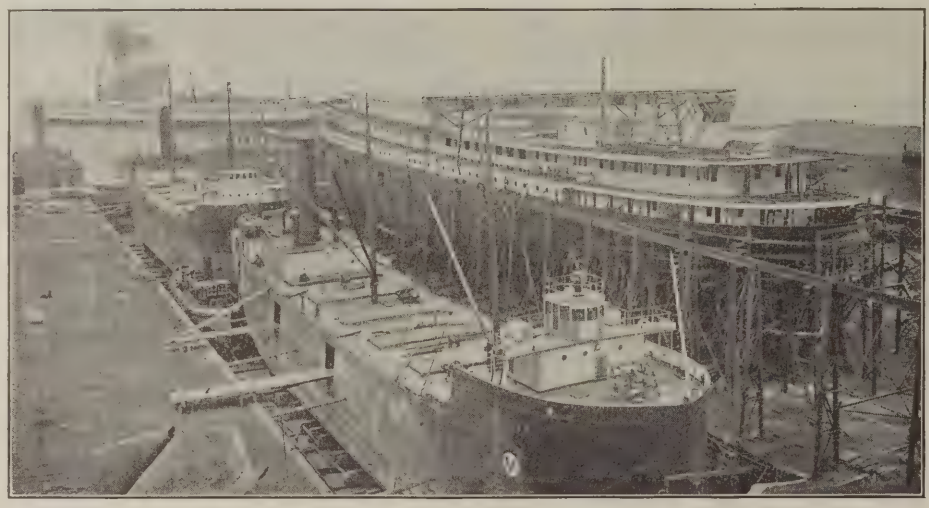

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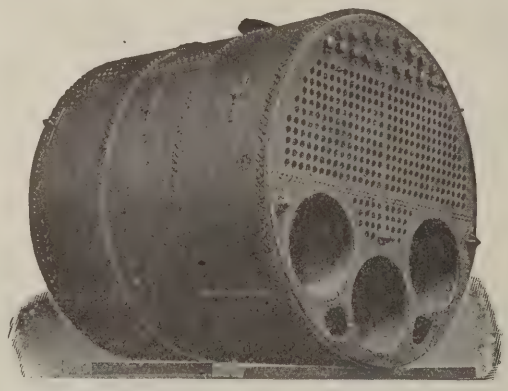

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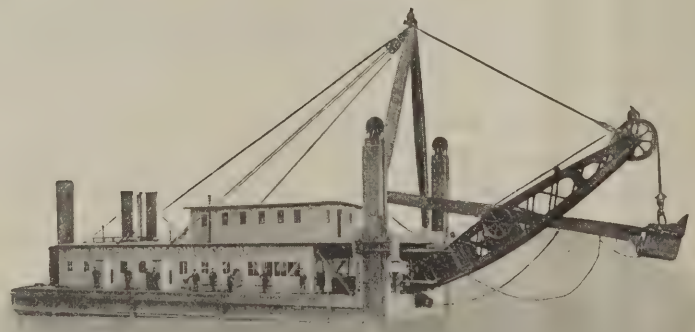

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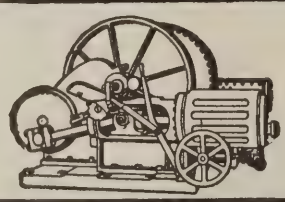

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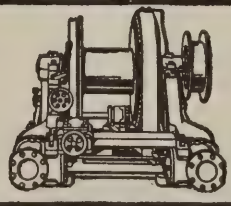

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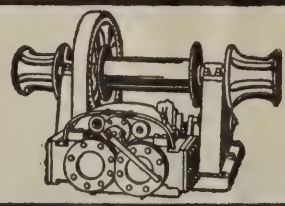

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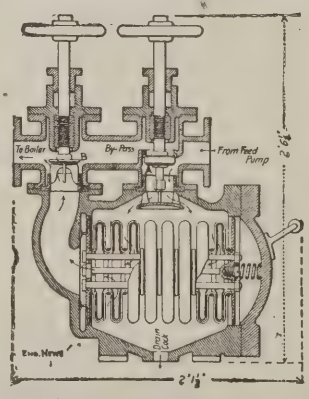

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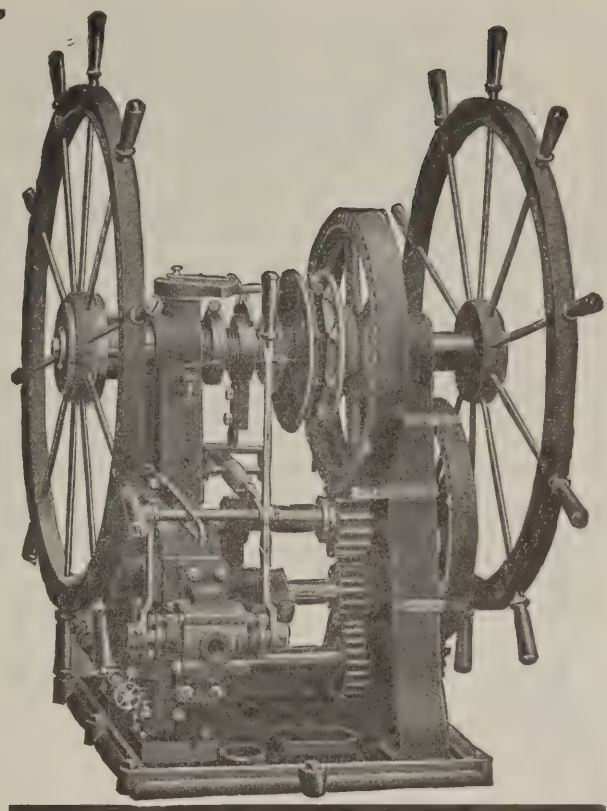

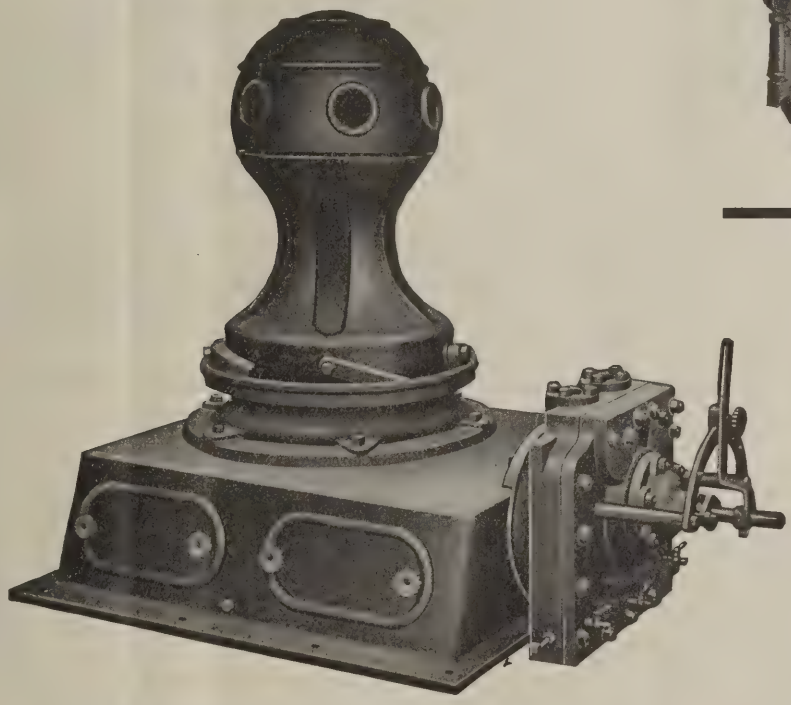

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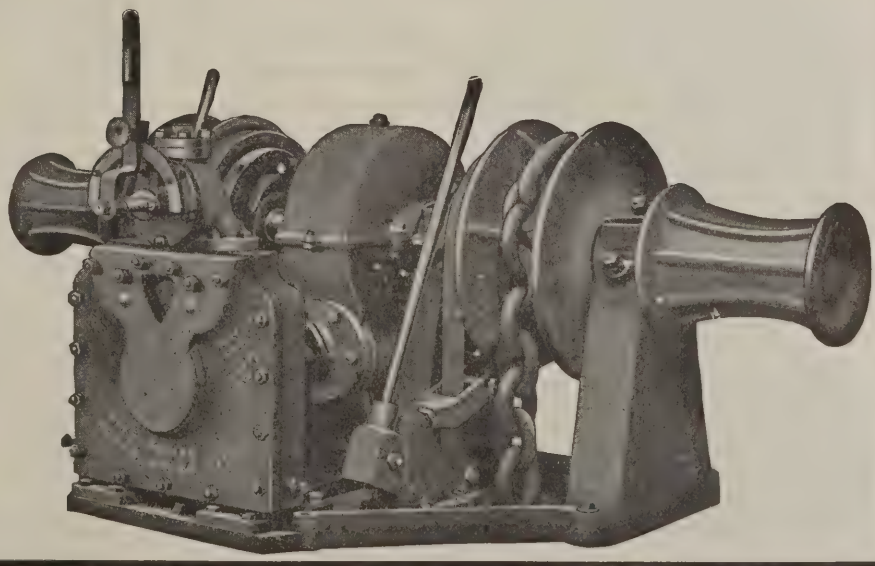

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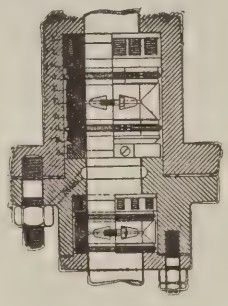

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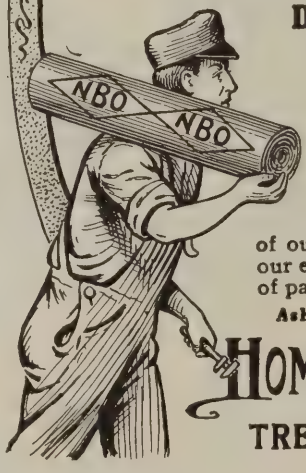

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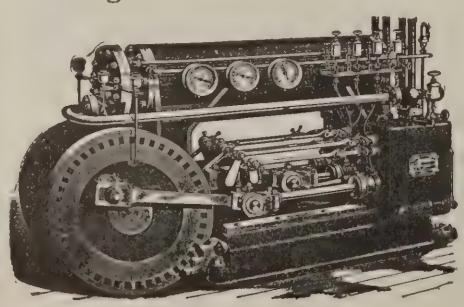

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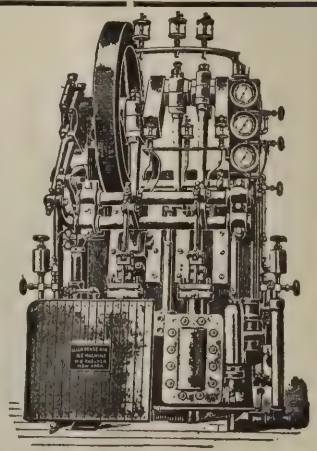

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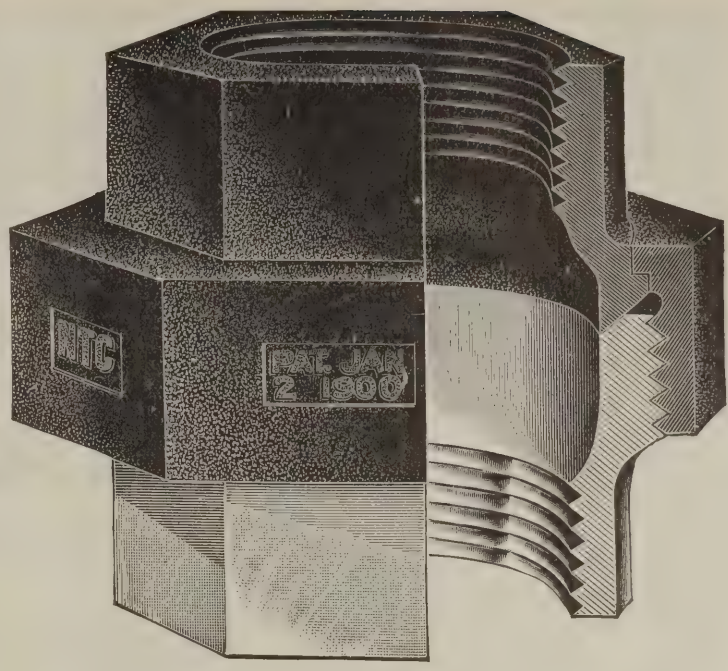

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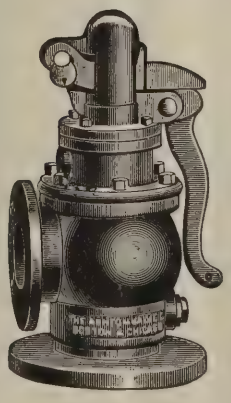

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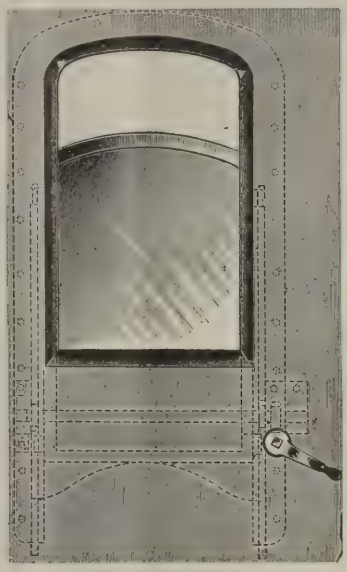

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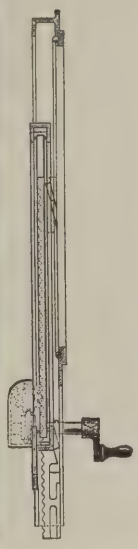

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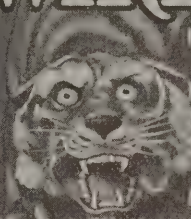

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Tug Champion and Her Tow

THE MARINE REVIEW has fortunately come into the possession of a few of the highly prized lithographs of the tug Champion and her tow in the rivers. ¶ In the early 60's 93 per cent of lake tonnage was sail. All iron ore shipments were carried in schooners. The bulk freight steamer as it exists today was unknown. A fleet of tugs was engaged in towing the schooners through the rivers, among them the most powerful and fastest in the world. ¶ This phase of navigation has wholly disappeared but has been most beautifully preserved pictorially in this lithograph of the Champion and her tow, delicately printed in water color pigments. ¶ No collection of lake marine views is complete without this celebrated lithograph.

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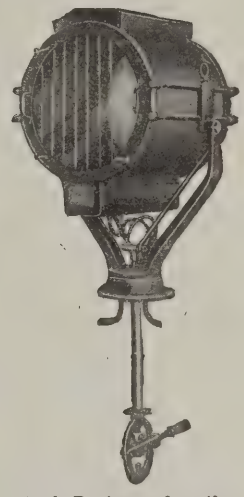

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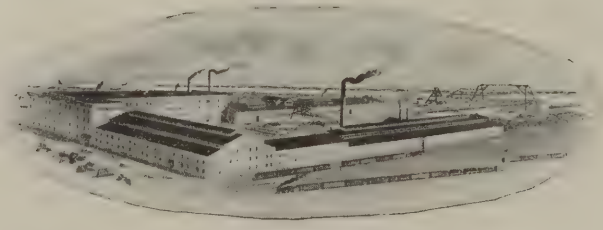

DETROIT PLANT—Engine Building and Repairs

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JAN 4 1927

THE MARINE REVIEW

VOL. 42 CLEVELAND AUGUST, 1912 NEW YORK No. 8

Electric Drive On Collier

The Jupiter, Building at Mare Island, Will Be Equipped With Electric Propelling Machinery—Description of the Drive

The Jupiter is one of the new government colliers and is a sister ship to the Neptune and Cyclops. The Cyclops is equipped with reciprocating engines and the Neptune with a turbine drive connected to the propellers by gearing. These ships have a displacement of about 20,000 tons and carry something like 12,000 tons cargo. They are designed to operate at 14 knots. The Cyclops in her 48-hour trial averaged 14.6 knots, with a coal consumption for the main engines only of 1.485 lbs. per I. H. P. per hour, the total I. H. P. of both engines in this run being 6,705. The average speed of propellers was 92 R. P. M. The results of trials of the Neptune cannot be given here but the fact has been published that her performance was not as good as that of the Cyclops, the difference being attributed to less efficient propellers and to inefficiency in the turbine. It is reported that the gearing works in an entirely satisfactory manner.

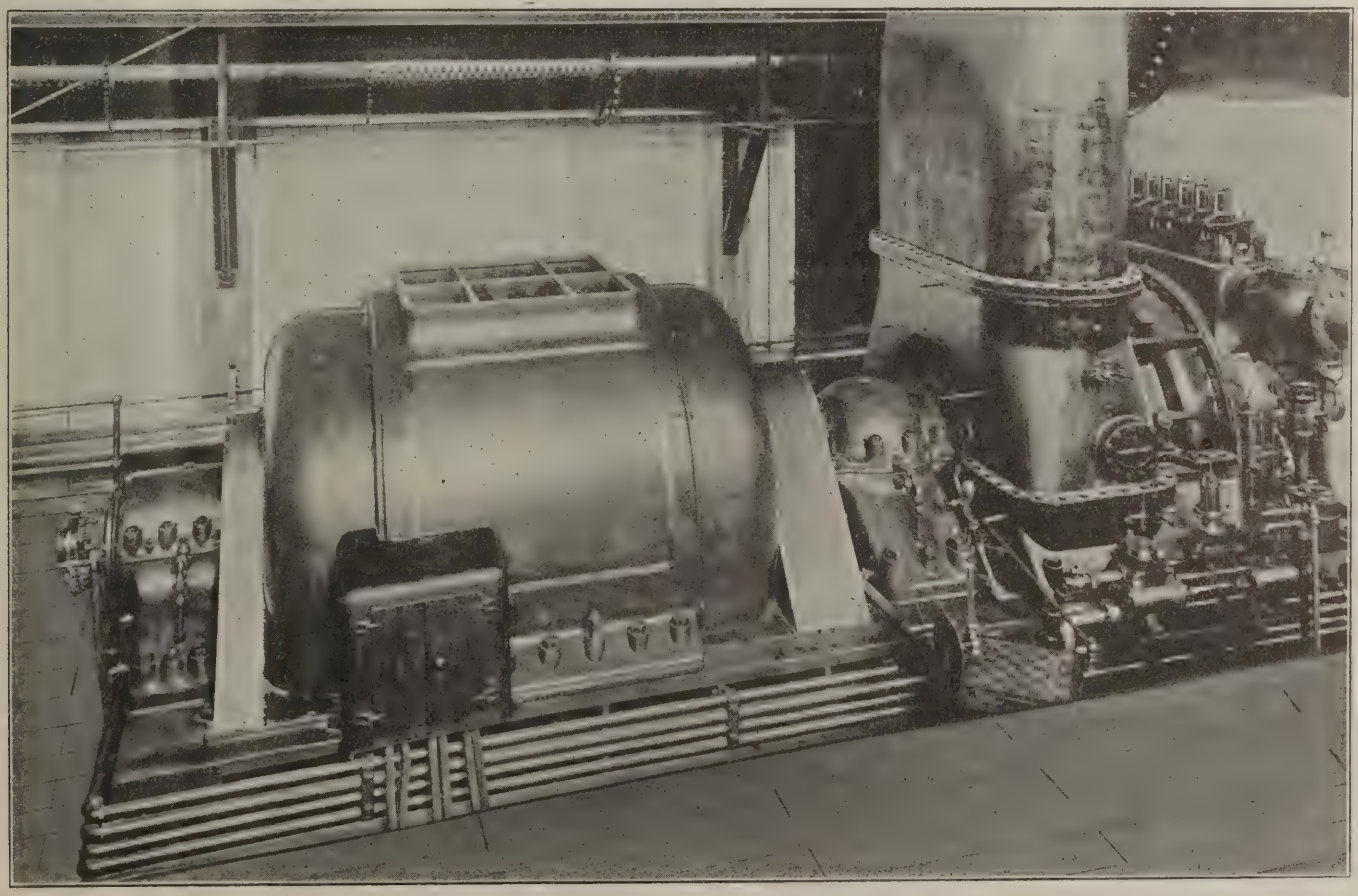
The following table shows comparisons of the known data concerning the equipments of these three vessels:

	Cyclops.	Jupiter.	Neptune.
Displacement, tons.	20,000	20,000	20,000
I. H. P., 14 knots.	5,600	.....	.....
Engine or turbine speed, 14 knots, r. p. m.....	88	2,000	1,250
Propeller r. p. m., 14 knots	88	110	135
Weight driving machinery, tons..	280	156	.....
Steam consumption in lbs. per S. H. P. hr.	†14	*12	.....

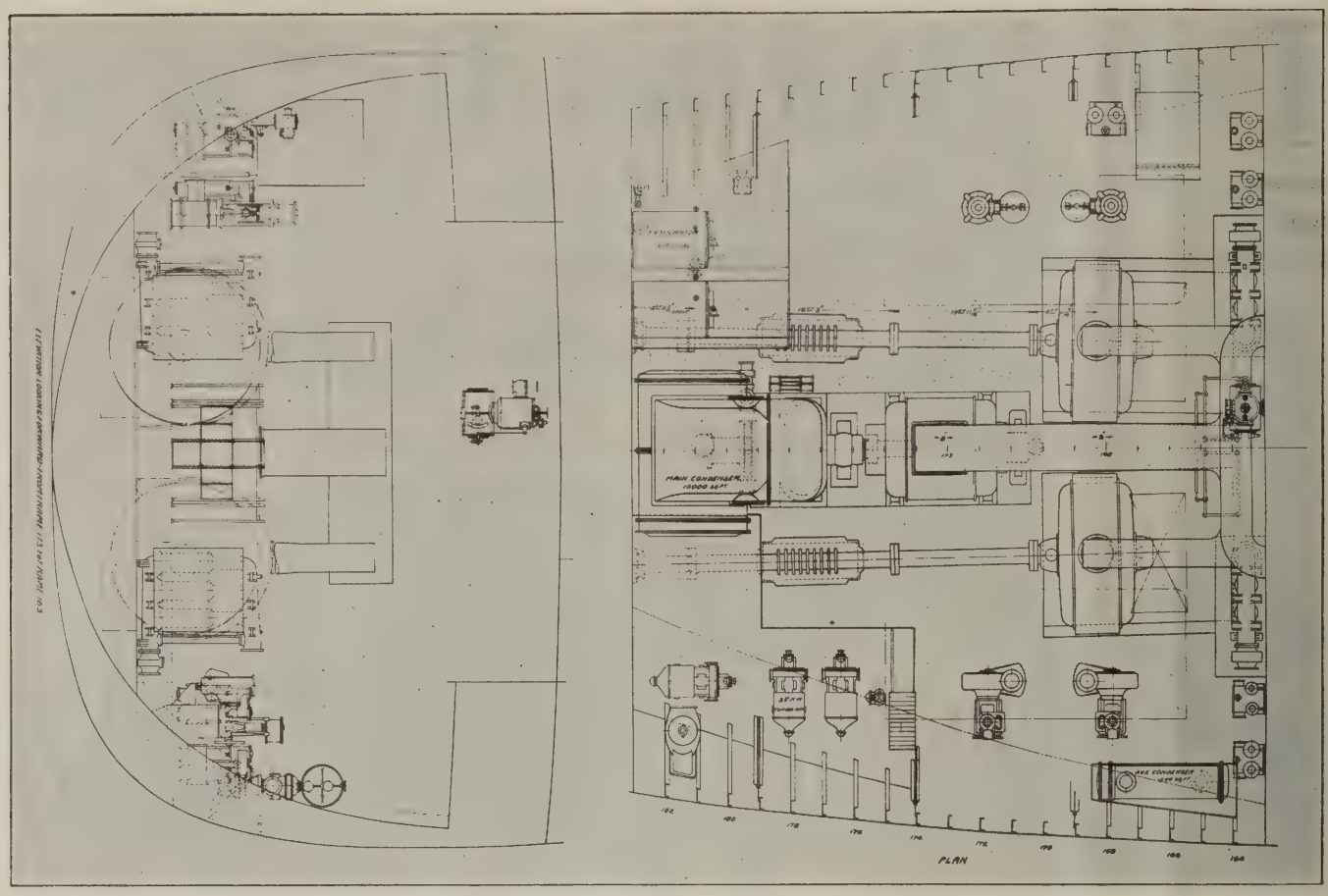
Character driving machinery—Cyclops: Two triple expansion engines.
Character driving machinery—Jupiter: One turbo-generator and two motors..
Character driving machinery—Neptune: Two turbines each with gearing.

†Estimated. *Tested.

The collier Jupiter, which is being built at the Mare Island Navy yard,



GENERATING UNIT, UNITED STATES COLLIER JUPITER



ARRANGEMENT OF MACHINERY, COLLIER JUPITER, ELECTRIC DRIVE

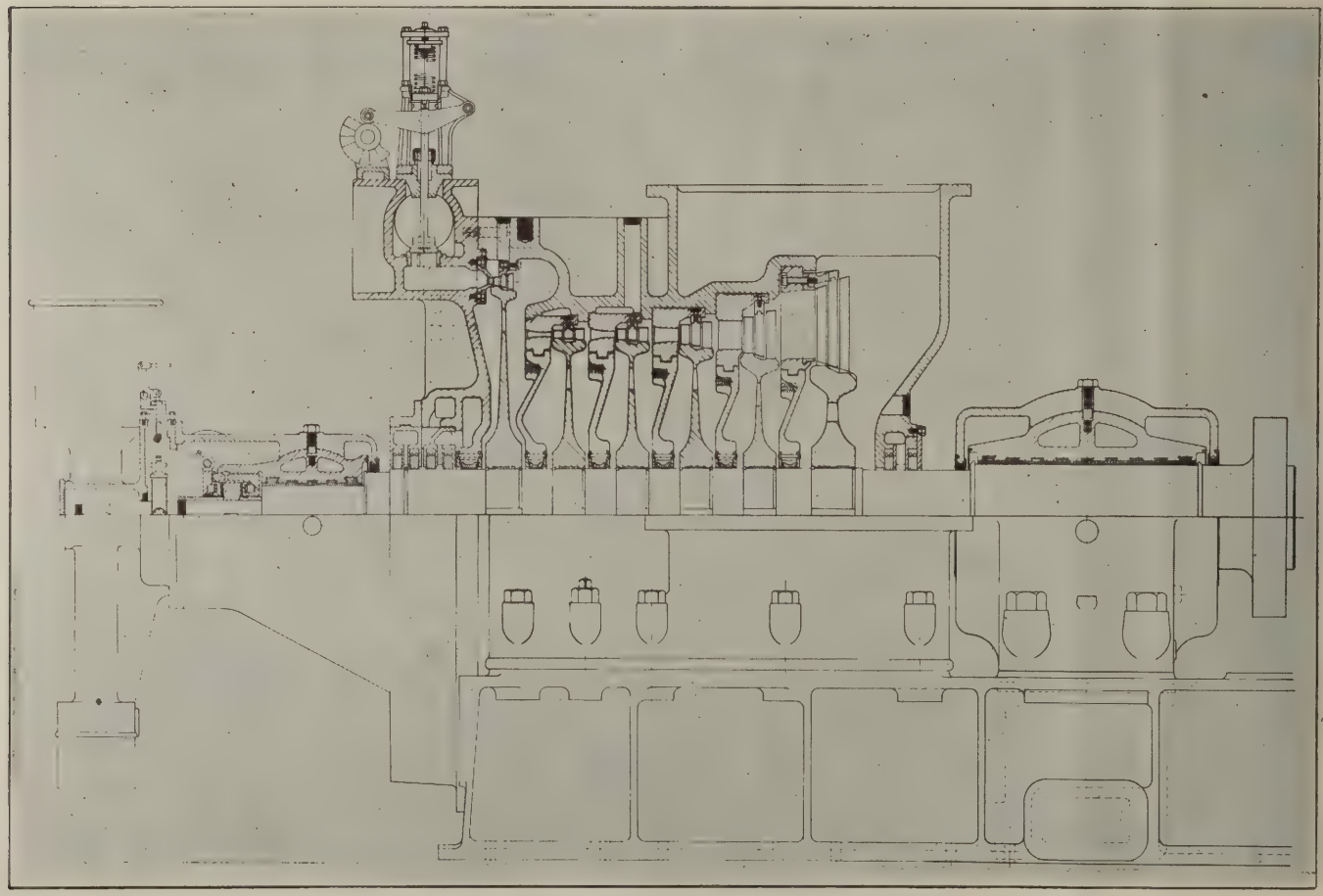


DIAGRAM OF JUPITER TURBINE

is to be equipped with electric propelling machinery designed by W. L. R. Emmet and built by the General Electric Co. The generating unit consists of a 6-stage Curtis turbine connected to a bipolar alternator, the speed of this unit at 14 knots being about 2,000 R. P. M. and the voltage about 2,200. This generating unit delivers electricity for two motors, one mounted directly upon each propeller shaft. These motors have 36 poles, therefore the ratio of synchronous speed reduction is 18 to 1, the propellers at 14 knots being designed to operate at 110 R. P. M. In addition to this apparatus there is a switchboard equipment which provides oil switches for connecting the motors for either direction of rotation and instruments which show and record the electric power delivered to the motors. There are also two water-cooled resistance devices which are put in circuit with the revolving part of the motors in the process of reversing. Connections for the insertion of these resistances are made by sliders on the motor shafts operated by levers attached to the motor frames.

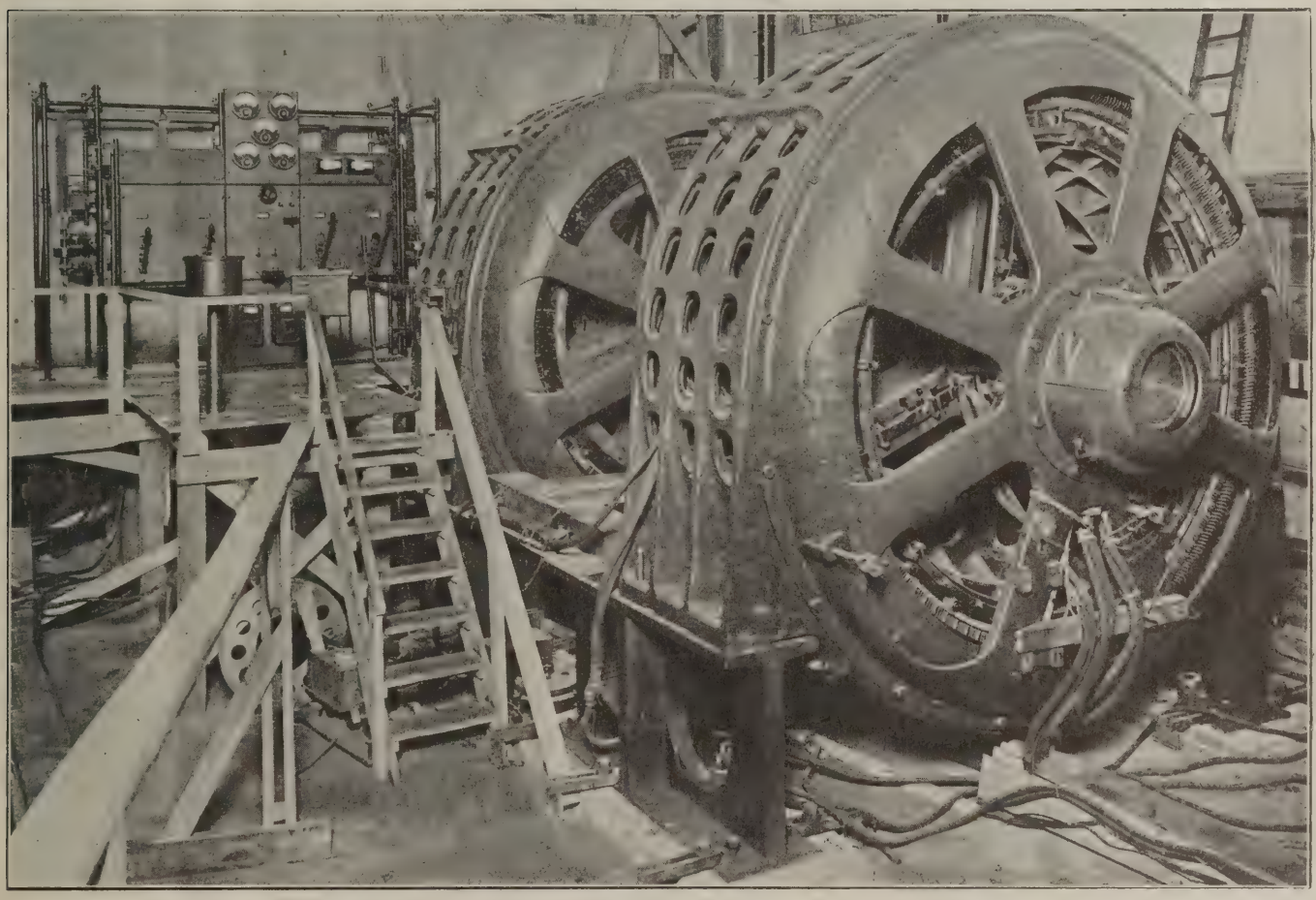
The generating unit and motors are self-lubricating and self-ventilating. Sheet metal ducts will be connected to their air outlets in such a manner that the heated air will be led to the suction of the fire room blowers so that it will not be released in the engine room.

Safety Interlocks

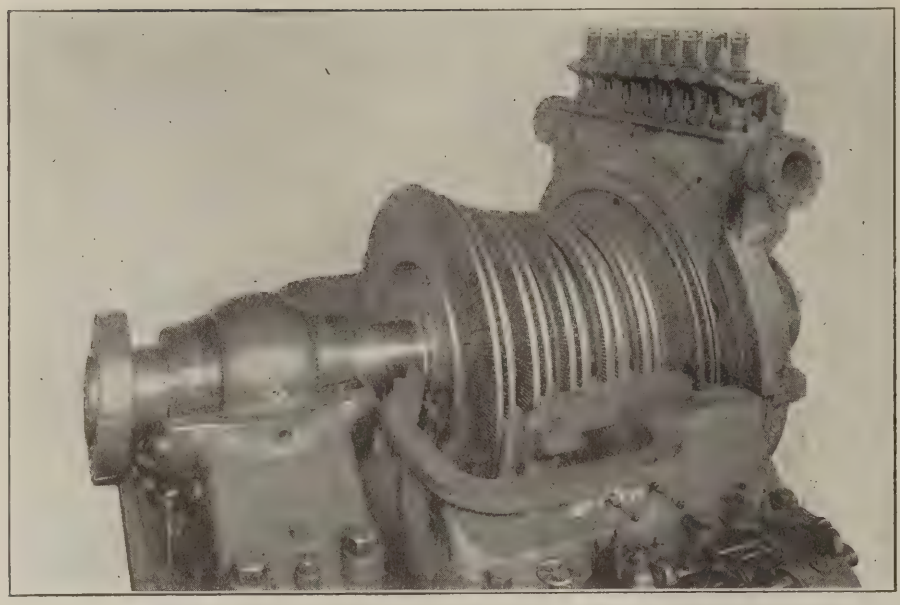
Since in such an equipment it is only necessary to make such electricity as is required for the actual driving of the ship, it is possible to so design the equipment that the maximum power which can be delivered by the generator is not greatly in excess of that of the regular requirements, and this fact practically overcomes the possibility of destructive trouble through wrong connections. It has, however, been thought desirable to arrange interlocks in such a manner that wrong connections cannot be made, the conditions being such that these interlocks involve no complication or uncertainty. Provision is thus made by which the go ahead switch and reversing switch cannot be closed at the same time and by which neither switch can be closed unless the resistance is in circuit with the motor secondary. For the levers which operate the connection and disconnection of the resistance, magnetic locks are attached which are energized by the field circuit of the generator. These locks prevent the movement of these levers until the generator has lost its field, and thus prevent any possibility of burning of contacts through movements at the wrong time or in the improper manner.

Speed Control

The speed of the motors in this vessel will be changed by variations in the speed of the generating unit, the ratio of speed reduction remaining fixed. The changes of speed, however, are not made by throttling as is usual with ship turbines. The turbine is equipped with a governor of novel construction which is so arranged that it is capable of automatically holding the speed at any point from about 5 knots up to the maximum. The setting of this governor is accomplished by the movement of a fulcrum which is controlled from a point near the switchboard and operating levers. Thus the operating engineer, without changing his position, can run the vessel at any desired speed ahead or astern, can stop and start, and from his instruments can see the speed and amount of power delivered to each propeller. When the apparatus is installed in the ship, arrangements will also be made by which in the same po-



TYPE 1-36-2,750-110-2,300 VOLT MOTORS, UNITED STATES COLLIER JUPITER



4,000-KW 6-Stage Curtis Turbine for Collier Jupiter—Mid-Bearing Cap and Top Intermediate Holder, Intermediate and Nozzle Removed

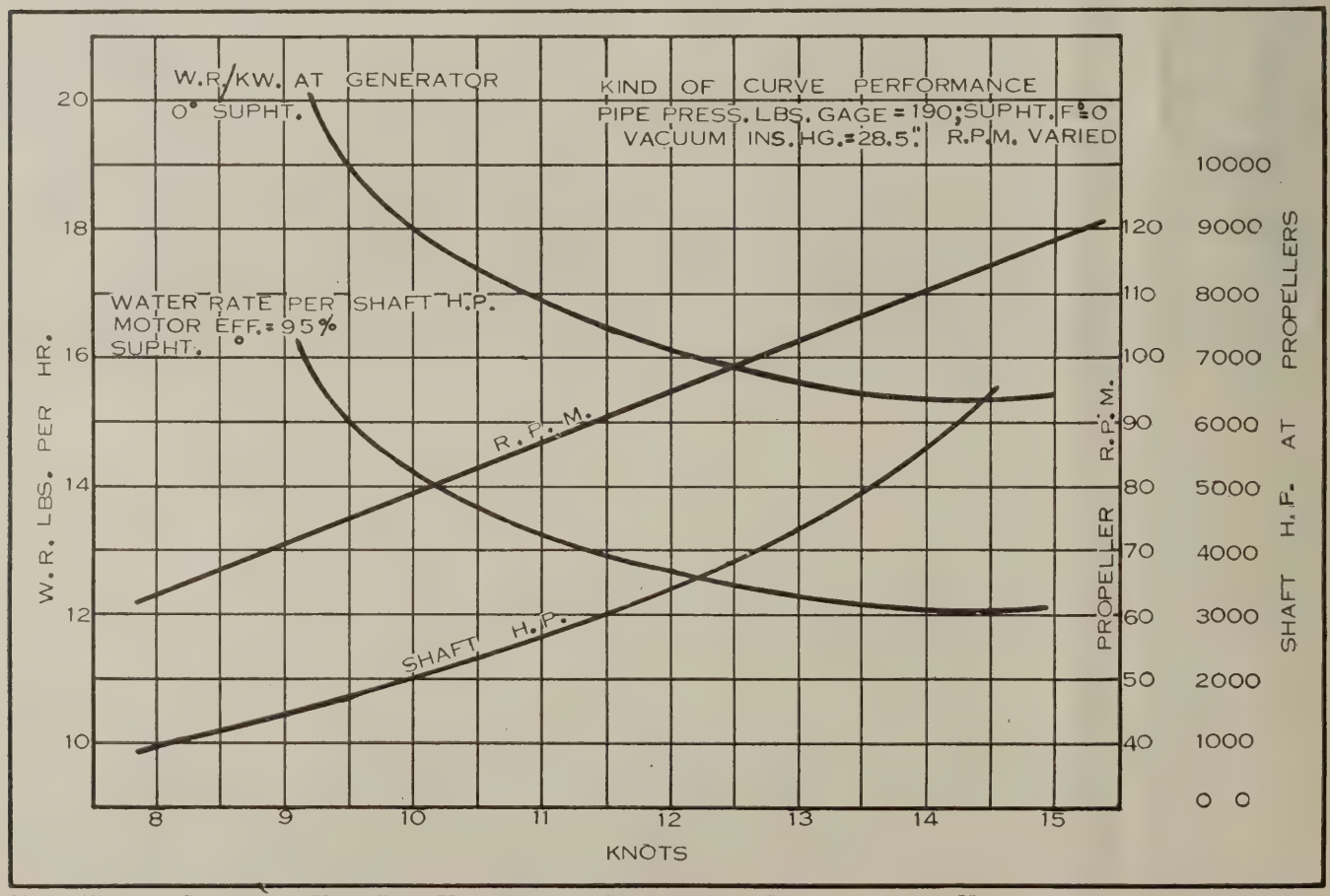
sition he can open and close the main throttle valve by hand or can trip it so that it closes instantly. The generating unit is also equipped with a simple automatic device entirely separate from the governor which trips the main throttle in case the speed of turbine exceeds a certain predetermined limit.

Electrical Conditions

The electrical methods used on this ship constitute the simplest known form of electric power transmission, and apparatus of similar character is used for a great variety of purposes on shore under conditions far more complicated and difficult and with an immunity from trouble which is practically complete. In many years of production of alternating apparatus of this general character and voltage, there has hardly been a case of insulation failure recorded and an investigation of this fact will convince any one that the electrical part of this equipment is particularly reliable and that in this respect it is far superior to the types of apparatus which have been used for ship propulsion. Furthermore, its nature is such that in the event of trouble, it could be very easily and quickly repaired. The switching apparatus is of an entirely reliable standard type, it can be easily replaced or repaired if it should get out of order, and if it were all removed the ship could be easily operated with temporary connections.

The turbine is so designed that all of its parts are accessible and replaceable and extra parts are carried on the vessel, so that it seems impossible that the machine could be subject to any serious interruption of service. While it is normally operated on the governor as described, it is in no way dependent upon it since by a simple disconnection it can be operated by the throttle from a point near the switchboard and motor levers. The turbine has six separate stages and in the event of loss of blades in one or more of these stages, it could quickly be arranged to operate on the remaining stages without any renewals. Any one stage of the turbine would propel the ship above half speed.

Turbines similar to this have practically replaced reciprocating engines for most uses on shore and much experience

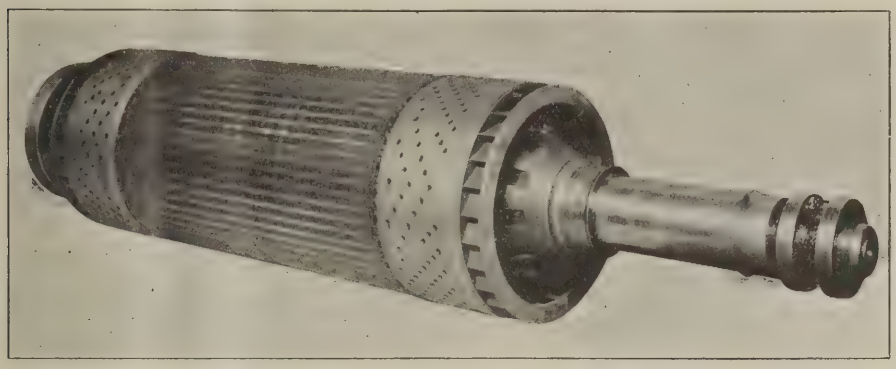


From Test of Generating Unit Run Under Proper Conditions of Speed, Load and Voltage and Reduced by Known Efficiency of Motors

has shown that in the matter of reliability and low maintenance cost, they are superior to any form of prime mover which has been used.

Tests Made in Schenectady

The apparatus is set up in the General Electric Co.'s power station, the turbine being connected to a condenser and one motor being installed in the same position which it will occupy on board ship with relation to the switchboard and controlling mechanism. The other motor is arranged as a generator and is coupled to the first motor so that it affords load for it. With this generating motor as load, the conditions of service can be approximated although they are more difficult than the driving of a propeller, since the load falls off only slightly with diminutions of speed unless its exciting current is reduced. With the apparatus so installed the processes of starting, stopping, speed variation, and reversal can be accomplished very much as they would be on board ship and the time and difficulty involved can be correctly judged. The motor can be operated at its full load or any desired proportion of this load and at any desired speed, variation being accomplished by mechanical connection to the governing mechanism of the turbine equivalent to that which will be used on board ship.



REVOLVING FIELD FOR UNITED STATES COLLIER JUPITER

This arrangement affords means of experimenting with the operating conditions, but does not afford means of testing water rates, since only one motor can be loaded. The water rates of the generating unit have been tested under all loads and conditions by delivering its power to a water rheostat in the usual manner, and the record of these tests is shown by the accompanying curve sheet. In these tests the effects of speed, voltage, vacuum, and superheat were all thoroughly investigated and a series of tests run under almost exactly the conditions of load, speed and voltage which will be characteristic of the ship's operation. The tests were made under exact conditions of steam pressures and vacuum specified for the ship.

Performance of the Selandia

The motor-driven ship Selandia, which sailed from London on her maiden trip on March 2, returned to London on July 15, having covered a distance of 21,086 miles, touching at Antwerp, Genoa, Port Said, Colombo, Penang, Singapore, Bangkok and returning via Singapore, Penang, Colombo, Port Said, Genoa, Aarhuus, Kiel, Copenhagen and London. She attained an average speed of 11 knots on 9½ tons of fuel per day at a cost of about $7.68 per ton. The total consumption for the round trip was 800 tons. This is the longest voyage ever undertaken by a motor-driven ship and naturally great interest was evinced in her upon her return to London. The owners state that no trouble whatever was experienced, the engines maneuvering with absolute certainty. The piston rings were only examined twice on the voyage and they and the cylinders were found to be perfectly clean. The exhaust valves, which consist of cast iron heads on steel stems, were also examined twice, most of them needing no attention, some being just cleaned and ground in. The voyage seems to have brought out no inherent defects in the principle of the four-cycle motor, such for instance as the sticking of the valves, the gumming of the piston rings or failure to reverse, as had been feared by many.

At any rate, the Selandia has demonstrated that 9,300 tons of cargo can be transported a distance of 21,840 miles on a consumption of 9½ tons of fuel per 24 hours, with a total engine crew of ten men and three boys and without any sacrifice of reliability or maneuvering capabilities in the ship.

On the other hand information comes from abroad that the Jutlandia, sistership of the Selandia and the first motor-driven vessel to be actually engined by a British firm, has not been altogether successful. Information is not at present obtainable as to the exact nature of the trouble.

It is known, however, that the American - Hawaiian Steamship Co. has abandoned its intention of installing Diesel engines in the three latest steamers placed with the Maryland Steel Co., and will install geared turbines instead.

Meanwhile the Clyde Shipbuilding & Engineering Co., Port Glasgow, Scotland, has launched the motor-driven package steamer Fordonian, for Norcross & Co., Toronto, and will equip her with Diesel oil engines built by themselves. This vessel will be given most extensive trials before she is sent across the ocean and it is not probable that she will reach the lakes before October. The Fordonian is 250 ft. long, 42 ft. 8 in. breadth, 16 ft. 10 in. deep to main deck and 26 ft. 6 in. deep to awning deck.

The Toiler, the first oil-driven vessel to reach the lakes, has again been placed in commission since her recent stranding. She is regarded in the nature of an experiment. She is rather slow, her actual speed being about 6 knots.

New Steamers for United Fruit Co.

Capt. William Anderson, manager of the marine department, United Fruit Co., Boston, advises that the company now has under construction at the yard of Workman, Clark & Co., Ltd., Belfast, Ireland, three ships for passengers and freight, about 8,000 tons each. Their approximate dimensions will be: 487 ft. in length, 55 ft. in breadth and 33 ft. 6 in. in depth. They are being designed for a speed of 16 knots.

When these steamers are completed the United Fruit Co. will have, including its English operating company, Elders & Fyffes, Ltd., a total of 37 refrigerated steamers of its own, all of which are new boats constructed within the past few years. Of this number 21 are operated by the United Fruit Co. and 16 by Elders & Fyffes. The distinction is not important as the English subsidiary is entirely owned by the fruit company. These 37 boats represent an investment of $18,000,000, which at the end of a 10-year term will have been entirely liquidated through sinking fund operations. In other words, the United Fruit Co. will ultimately have an investment of $18,000,000 without a dollar of capital against it.

The submarine F-4, which was built at the yard of the Seattle Construction & Dry Dock Co., Seattle, Wash., underwent her contract trials recently successfully.

Steamer Thousand Islander

Designed to Care for the Tourist Traffic of the Thousand Islands — Built in Record Time by the Toledo Ship Building Co.

THE Toledo Ship Building Co. recently delivered the steamer Thousand Islander to the Thousand Island Steamboat Co., which has recently been taken over by the Richelieu & Ontario Navigation Co., and will hereafter be known as the Richelieu & Ontario Navigation Co.'s lines operating in conjunction with the New York Central railway system. The Thousand Islander has been specially designed to take care of the tourist traffic of the Thousand Islands and while the contract was not let to the Toledo Ship Building Co. until last spring she was delivered in July in ample time for the season's business, a notable record in dispatch. The leading particulars of the Thousand Islander are as follows:

Length over all, 172 ft. 9 in.; keel 164 ft.; depth 9 ft. 6 in.; gross tonnage, 355, and net tonnage, 241.

The new steamer is of the tunnel stern, shallow draft twin screw type with main, promenade and boat decks, having accommodation for 1,000 passengers. The hull is constructed of steel up to the main deck, the superstructure, including cabins, being of wood. The steel hull is divided into six compartments by tranverse bulkheads, three being water tight and two non-water tight. The main engines, of which there are two, are of the two-cylinder type, 15 and 30 in. diameter by 20 in. stroke, supplied with steam from two single-ended Scotch boilers, 12 ft. 6 in. by 10 ft. 6 in.

Details of Hull Construction

The peak bulkhead at frame 16 is made up of 10 lb. plate, stiffened in a vertical direction by 3½ x 2½ x 6.1 angles and in a horizontal direction by 2½ x 2½ x 4.1 angles. The plating of water tight bulkheads at frame 26 and 66 runs from 12½ lbs. below 6 lbs. above. Horizontal and vertical stiffeners are all 2½ x 2½ x 4.1 lbs. The bulkhead at frame 44 is non-water tight and separates the boiler from the engine space. It is built up of 6 lb. plate stiffened vertically by 2½ x 2½ x 4.1 angles and horizontally by 3½ x 2½ x 7.2 angles. The engine space is separated from the after hold by a non-water tight bulkhead at frame 55; it is built up of 14 B. W. G. plate and stiffened vertically and horizontally by 2½ x 2½ x 4.1. Double angles are used in connecting the water tight bulkheads to the shell, while single angles are used for those that are non-water-tight. Diamond shaped lines are fitted to all bulkheads in way of outside strakes of plating. There are two coal bunkers placed on opposite sides of the ship and having doors that open into the fire hold. The starboard bunker extends from frame 36 to 44 and the port bunker from 26 to 35. The bunkers are built up of 6 lb. plate stiffened vertically by 2½ x 2½ x 4.1 angles spaced 24 in. keel to keel.

Sheathed with Rock Elm

The boiler casing consists of 6 lb. flanged plate built up from 10 lb. coamings. The plates are flanged the necessary depth to do away with the angle stiffeners. The shell plating includes the garboard strake of 11 lb. fore and aft, bilge and bottom plate 10 lb. fore and aft. Strake next below the sheer strake 11 lb. fore and aft, while the sheer strake is 12 lb. for 2/3 length amidships reduced to 11 lb. at the ends. The keel plate is flat, being 30 in. wide x 15 lb. fore and aft, and worked in lengths of not less than 7 frames spaces. The butts are double riveted; a single inside 18 lb. strap being fitted extending to the garboard edge laps. The garboard, bottom and bilge strakes are butt lapped, double riveted, ⅝ in. rivets being used. The side and sheer strakes are butt lapped, double riveted, ¾ in. rivets being used. The fore and aft edge laps of the garboard and sheer strakes are double riveted, the remainder are single riveted.

The under body of the boat is sheathed with rock elm 2½ in. thick. The sheathing extends from between frames 15 and 16 to frames 66 and 67 and extends upward to the turn of the bilge. After the shell plating had been caulked, the wood sheating was fastened in place by means of bolts and nuts and the bottom was then caulked in the usual manner. The floors, 12 in. deep, are solid on every frame, being formed of 10 lb. plates, with the exception of the engine and boiler space where they are increased to 14 lb. Deep floors are provided for the engine space and also for the ends of the ship. The frames are formed of 3 x 2½ x 4.5 lb. angles and spaced 24 in. keel to keel. The reverse frames forward and aft of the engine and boiler space are 2½ x 2½ x 4.1 angles extending alternately to the main deck stringer plate and to the upper turn of the bilge. In the engine and boiler space they are increased to 5 lb. and all extend to the main deck stringer plate, while additional reverse frames are fitted for the length of the floors.

There are two longitudinal keelsons on each side of the center line, worked intercostal between solid floors on each frame. The longitudinals are formed of 10 lb. vertical plates whose lower edge is flanged and riveted to the shell, while the top edge is riveted to a 6 in. x 10.5 lb. channel which extends fore and aft over the tops of the floors to which it is attached by angle clips.

The channels are continuous fore and aft and are not cut in the way of bulkheads. Bracket connections are made at all the bulkheads besides the necessary water tight construction. The longitudinals are carried as far forward as practicable and as far aft as the stern, where they help to stiffen the roof of the tunnel.

The bilge and side stringers are formed of a 6 in. x 10.5 lb. channel connected to the frames by 2½ x 2½ x 4.1 lb. clips. The channels are slotted in way of the frames and cut at the bulkheads to which they are attached by suitable brackets. The outer flange of the channel is connected directly to the shell, while the channel itself is fastened to the frames by angle clips. At the stem the stringers are connected by 10 lb. plate breast hooks together with the necessary angles.

Engine Foundation

The foundation for the engines is formed mainly of four longitudinal girder plates, each of 10 lb. intercostal, between the floors to which they are attached by means of double angles 2½ x 2½ x 4.1 lb. The girder plate itself extends to the shell to which it is connected thereto. The rider plates are continuous and formed of 20 in. plates 15¾ in. wide connected

to the floor plates and longitudinals, thereby tying the whole together.

There are two saddles for each boiler consisting of 14 lb. plate and double angles 3 x 3 x 7.2 lb. The fore and aft saddles for each boiler are connected by 14 lb. plate girders to which they are connected by 2½ x 2½ x 5 lb. angles.

The main deck beams are of angle steel 5 x 3 x 8.2 lb. placed on every frame to which they are connected by 10 lb. gusset plates 15 in. x 15 in. The camber is 6 in, 32 lb. The main deck stringer plates are 18 in. x 10 lb. for 2/3 length amidships reduced to 8 lb. at the ends. They are fitted close to the sheer strake plating and connected thereto by a 6 in. x 14.52 lb. Z bar. The top edge of the sheer strake is flanged outward to receive the lower flange of the Z bar while the deck stringer is connected to the upper flange of the bar.

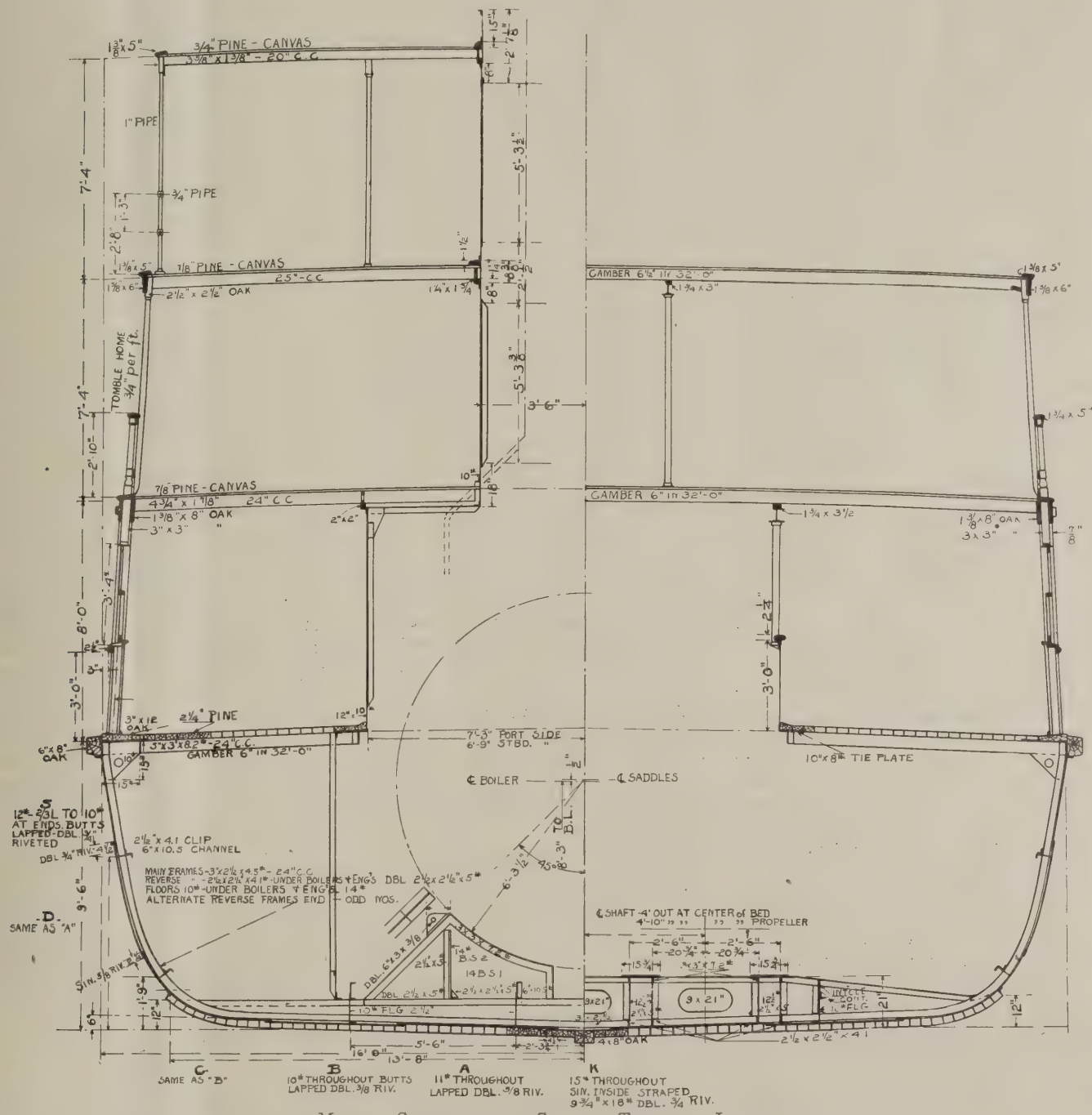
The only plating on the main deck, other than that of the main deck stringer is that due to the reinforcement of hatch openings in the way of boiler and engine space and stairways. The main deck is of pitch pine 2¼ in. thick x 3¾ in. wide, laid in long lengths, and well fastened to the beams and plating by ½ in. dia. cheese head, square necked, galvanized bolts and nuts. An oak fender strake 6 in. x 8 in. is placed on a line with the main deck and extends around the stern to as far forward as the stem.

Machinery Equipment

There are two main engines of the two cylinder, vertical, direct acting compound type, well balanced and each capable of developing about 500 I. H. P. at 200 revolutions per minute, from a steam pressure of 150 lbs. per square inch.

The sequence of cylinders, beginning forward, is high pressure and low pressure, with diameters, respectively, 15 and 30 in. and a common stroke of 20 in.

The main engines are placed 8 ft.


3/4" PINE - CANVAS
1" PIPE
3/4" PIPE
7/8" PINE - CANVAS
2.5"-CC
2½" x 2½" OAK
TOMBLE HOME 3/4" per ft.
7/8" PINE - CANVAS
4¾" x 1 1/8" 24" C C
1 3/8" x 8" OAK
3" x 3" "
2" x 2"
CAMBER 6" in 32'-0"
3" x 12" OAK
2¼" PINE
3"x3"x8.2 - 24" C C
CAMBER 6" IN 32'-0"
7'-3" PORT SIDE
6'-9" STBD. "
℄ BOILER
℄ SADDLES
10"x8" TIE PLATE
CAMBER 6½" in 32'-0"
1¾ x 3½
1 3/8" x 8" OAK
3 x 3" "
1¾ x 5"
1 3/8 x 6"
12"-5/3L TO 10" AT ENDS BUTTS LAPPED-DBL 3/4" RIVETED
2½" x 4.1 CLIP
6" x 10.5 CHANNEL
DBL 3/4" RIV.
MAIN FRAMES-3"x2½"x4.5"- 24" C C
REVERSE " -2½"x2½"x4.1" -UNDER BOILERS & ENG'S DBL 2½x2½"x5"
FLOORS 10" -UNDER BOILERS & ENG'S 8.14"
ALTERNATE REVERSE FRAMES END — ODD NOS.
℄ SHAFT-4' OUT AT CENTER of BED
4'-10" " " " " PROPELLER
-D- SAME AS "A"
14 B.S.2
14 B.S.1
DBL. 6"x3"x 3/8
DBL. 2½ x 5"
DBL. 2½ x 2½ x 5/16
1.5" FLG 2½"
9x21"
3 x 21"
INSIDE CONT. 1/2" FLG
4x8" OAK
2½ x 2½" x 4.1
-C- SAME AS "B"
B 10" THROUGHOUT BUTTS LAPPED DBL. 3/8 RIV.
A 11" THROUGHOUT LAPPED DBL. 3/8 RIV.
K 15" THROUGHOUT SIN. INSIDE STRAPED 9¾" x 18" DBL. ¾ RIV.

MIDSHIP SECTION OF THE STEAMER THOUSAND ISLANDER

apart in a single engine room without a center line bulkhead, the starting platform being very conveniently located between the engines, with ample space for the engine crew to work in. The cylinders are fitted with safety valves in the bottom and covers. From the center of the engines to the center of propeller is 62 ft. 6 in.

The cranks are set at 90 degrees. The high-pressure cylinder has one piston valve 9 in. in dia. while the low pressure cylinder has a flat, double ported slide valve 28 in. wide and 24 in. long. The valve travel in each case being 4¼ in.

The valves are operated by Stephenson's link motion through overhung bar links, whose motion is derived from eccentrics keyed to the crank shaft. The valve gear is so adjusted that the mean cut off in full gear will be about 66¾ per cent in the high pressure cylinder and 56¼ per cent in the low pressure cylinder. The point of cut-off will be variable by means of slotted reverse arms. The pins on the links for the attachment of the eccentric rods are 24¼ in. center to center, the full throw of the links being 12 in.

The high-pressure eccentric sheaves are of cast iron and made in one piece, while the low-pressure sheaves are made in halves. The straps for all the eccentrics are of cast iron and made in halves, the bearing surface in each being 2¼ in. wide. The distance from the center of the shaft to the center of the links is 50½ in.

The valve stems in all cases are 1½ inches in dia. through the valves, 2 in. in dia. through the stuffing boxes and 2¼ in. at the guides. The piston rods are each 3¼ in. dia. The framing of each engine consists of two cast iron I section columns at the front and two cast iron box section columns at the back.

Bed Plates of Cast Iron

The bed plates are of cast iron and contain three bearings each. The exhaust passage from the high to the low pressure cylinder is formed by an 8 in. extra heavy steel pipe, bent to the arc of a circle and connected by means of flanges to the upper facing of the steam chests, as illustrated in the general arrangement of the engine.

From the inboard side of each low-pressure steam chest a steel exhaust pipe leads to a cast iron fitting bolted directly to the condenser, which is common for both engines. Each exhaust pipe has a diameter of 11 in. at the cylinder and 12 in. at the condenser.

The high-pressure pistons are of cast iron fitted with cast iron plugs arranged for water grooves. The low-pressure pistons are of cast steel fitted with the usual arrangement of cast iron follower and two spring rings in each piston. All pistons have a depth of 4½ in.

The crossheads are of cast steel with pins 4 in. dia. by 5½ in. long. Brass slippers are fitted for both ahead and astern thrusts. The slipper for the ahead thrust is 10 in. wide by 12 in. long, while the combined width of the slippers for the astern thrust is 6 in. with a length of 12 in.

The crosshead backing guides of L section are made of cast iron and bolted directly to the back columns.

The connecting rods, which are 45 in. center to center, have a diameter at the crosshead end of 3¼ in. and 3¾ in. at the crank end. The crosshead end has a single connection, and the adjustment for wear at that end is taken up by means of a wedge, while at the crank end a bolt connection is used.

The crank shafts are each made in one forging with a coupling disc 14½ in. dia. x 1⅞ in. thick at one end. The length over all is 7 ft. 2½ in. The journals are 6¾ in. dia. while the crank pins are 6¾ in. dia. by 8 in. long.

Details of Shafts

The crank webs are 7¾ in. wide by 4¾ in. thick. Opposite each crank slab a tail piece is forged, to which the cast iron counter-balances are bolted. The counter-balances are of sufficient weight to take care of the reciprocating as well as the rotating weights. Each thrust shaft is 6¾ in. dia. and 3 ft. 7 in. over all, being fitted with four collars 13 in. dia. by 1⅜ in. thick and 3½ in. apart. A coupling disc is forged on each end 14½ in. dia. by 1⅞ in. thick.

There are two intermediate shafts for each engine, 6¾ in. dia. by 12 ft. 9¼ in. long and coupling discs forged at each end. The tail shaft is 7¼ in. dia. in the bearings and 6¾ in. dia. between the bearings and at the ends. Length over all is 30 ft. 3 5/16 in. A cast iron coupling disc 18¾ in. dia. is shrunk on the forward end.

Each crank shaft has three bearings 6¾ in. dia., two being 8 in. long and one 11¾ in. The thrust bearings consist of cast iron pedestals fitted with three cast iron horse shoe collars lined with white metal in each pedestal.

The intermediate shafting for each engine will be carried by two spring bearings made of cast iron, the lower halves being lined with white metal.

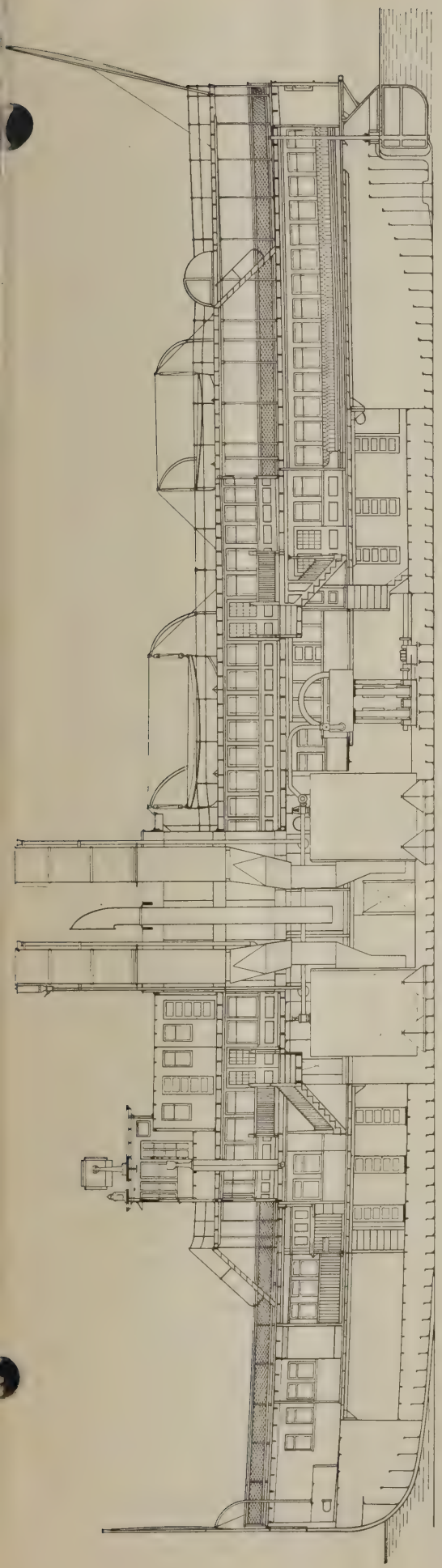
Each propeller shaft will be supported at the outboard strut and also in the stern tube by a bearing at each end. The bearing in the strut will consist of a brass sleeve 22 in. long carrying wood strips of lignum vitae. The after bearing in the stern tube is a duplicate of the strut bearing, while the bearing at the inboard end consists of a brass sleeve.

The stern tube is made of two cast iron sleeves connected by a standard steel pipe 9 in. dia. The after sleeve is made to fit a cast steel boss riveted to the shell of the ship while the inboard end is flanged to receive the after collision bulkhead. The over all length of stern tube is 14 ft. and 5 in. There are two propellers of cast iron, solid, three bladed, and made to the right and left hand. The diameter of each wheel is 6 ft., while the pitch is 9 ft. The developed area for one wheel is 14½ sq. ft. The propellers rotate outboard.

Boilers

Two single ended Scotch boilers of the cylindrical type working at a pressure of 150 lbs. to the square inch are located on the center line of the ship in one boiler room. The distance apart of the boilers longitudinally is 9 ft. 9 in. between the furnace fronts, while each boiler has a separate funnel spaced 12 ft. apart. The funnels are 40 in. inside dia., while the outside stack is 48 in. dia., the top being 40 ft. 3 in. above the grates. The boiler aft projects through the bulkhead between the boilers and engines about 3 in. There is an exit to the main deck at the forward end of the boiler room. Ventilation for the boiler room is provided by two 24 in. ventilators placed in the center of the boiler room and whose outlets are carried down to a height level with the bottom of the air heater.

The furnaces, two in each boiler, have internal and maximum diameters of 45 in. and 48 15/16 in. respectively, the thickness being 15/32 in. The grates are 5 ft. 6 in. long, the grate surface of each boiler being 41¼ sq. ft., while the heating surface in each boiler is 1,713 sq. ft., or a ratio of 41.5 to 1; making for the two boilers an aggregate grate surface of 82.5 sq. ft. and a total heating surface of 3,426 sq. ft. The furnaces are of the Morrison suspension type and have independent combustion chambers. The length of the tubes between the tube sheets is 6 ft. 10 3/16 in. and they are spaced 3½ in. in a vertical and 3¾ in. in a horizontal direction. Each boiler contains 326 tubes, of which 44 are stay tubes; all have an outside diameter of 2½ in. with a thickness of No. 10 for the stay tubes



INBOARD PROFILE OF THE STEAMER THOUSAND ISLANDER

and No. 12 for the ordinary tubes. The tube sheets have a thickness of ⅝ of an inch. The top of the combustion chamber, which is 9/16 of an inch thick, is supported in the usual manner by bridge girders. The boiler shell is 15/16 in. thick.

Forced Draft

The positive forced draft unit consists of a No. 6 Sirocco fan direct connected to a 5 x 5 high pressure engine, the whole being furnished by the American Blower Co., Detroit, Mich. The suction of the fan is taken from the engine room, while the air is discharged through a 24 x 24-in. galvanized steel pipe to the air heaters which are studded to the boiler fronts. The suction of the fan has a diameter of 31¾ in., while the discharge has a sectional area of 576 sq. in. The air heater for each boiler measures 9 ft. long by 2 ft. 8 in. wide and 5 ft. 2 in. deep. Each heater consists of 127 horizontal tubes whose ends are expanded into steel headers, ¼ in. thick. All the tubes are of steel, 2¼ in. outside diameter, No. 14 gage and 9 ft. long. The total heating surface for both air heaters is 1,346 sq. ft. The operation of the positive draft is such that the burnt gases from the boiler pass by on the outside of the air heating tubes, while the fresh air for the furnaces is forced through the tubes, thus abstracting heat from the boiler gases for the benefit of combustion.

Arrangement of Hold

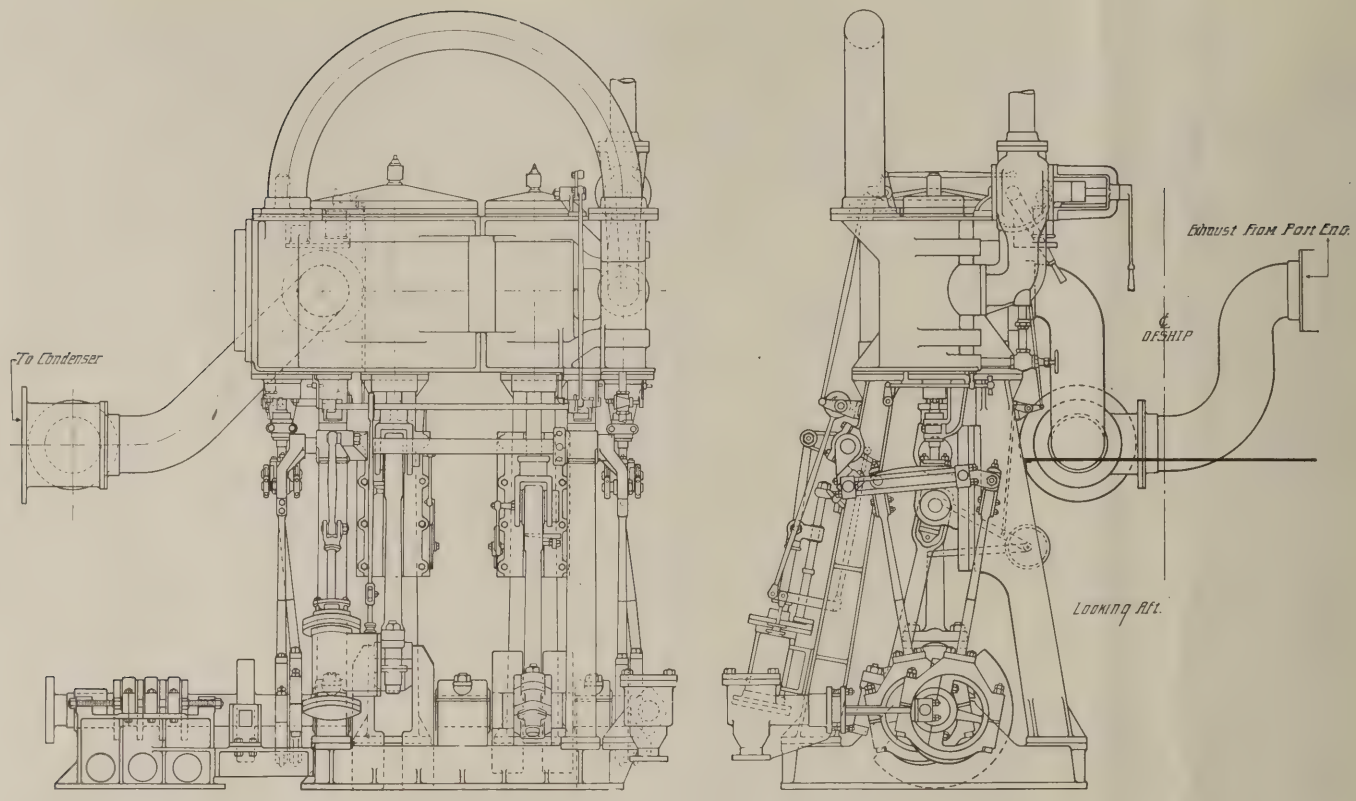
The hold is arranged for chain locker, crew's quarters and power plant. From frame 1 to 16 there are accommodations for four firemen and seven deck hands. There are staterooms enough from frame 16 to 26 to care for souvenir boys, mess boy, bartender, chef and assistant, two waiters, oiler, watchman and steward. The two boilers and engines, together with the auxiliaries, take up the space from frame 26 to 55. The space from frame 55 to 66 is occupied by 14 people, including the chief engineer, assistant engineer and electrician. All berths are of metal while the quarters are finished in redwood.

The Main Deck

On the main deck a hand capstan windlass occupies the space as far aft as frame 7. From frame 7 to 12 space is taken up by the men's toilet, which is finished in redwood. The bar room is finished in chestnut and leads as far aft as frame 19. Access to the toilet and bar room is maintained by a 3-ft. passage extending along the port side of the ship forward from frame 19 and terminating in the windlass room. This passage is finished in oak. The deck from frame 19 to 43 is clear with the exception of the boiler casing, which is 14 ft. wide and extends from frame 26 aft to 44. The upper part of the boiler casing forward is cut away to make room for the stairs leading from the promenade to the main deck. The forward gangways extend on each side of the ship from frame 22 to 25. This part of the ship is finished in oak. The ship is coaled through five 20-in. diameter scuttles placed between frames 26 to 42. The starboard side of the ship from frame 43 to 54 is taken up by the galley, which extends from the ship's side to the engine hatch coaming. A passage is left between the galley and boiler casing to connect with an athwartship passage between the forward engine hatch coaming and the after boiler casing, making a clear passage from port to starboard of 42 in. wide. This passage in turn connects with a fore and aft passage on the port side leading from the main deck amidships to the social hall. The ladies' lavatory, on the port side, extending from frame 43 to 56, communicates with this passage. The engine hatch is 13 ft. wide and extends from frame 46 aft to 54. The social hall, extending from frame 54 to 62, includes the stairs leading from the main to the promenade deck, while gangways take up the space from frame 56 to 59. The breakfast room, extending from frame 62 aft to the stern, includes the linen room on the starboard side and the purser's room on the port. The breakfast room is finished in quartered oak and contains 20 tables with redwood tops. The purser's room, linen room, galley and ladies' lavatory are finished in redwood, while the social hall is finished in mahogany.

Promenade Deck

The promenade deck extends from stem to stern and is clear but for a closed cabin, 19 ft. wide, which extends from frame 19 to 62. The forward end of this cabin contains the stairs leading to the main deck, while a stack casing, 7 ft. 6 in. wide, extends from frame 31 to 41. The after end of the cabin is taken up by stairs leading to the social hall on the main deck and by a souvenir counter placed in the extreme end. The deck is supported amidships by the boiler casing, which in turn is given additional strength. Forward



ENGINES OF THE THOUSAND ISLANDER

and aft of the boiler casing I-beam stringers in connection with gas pipe stanchions are used in giving support to the deck, while the space between the promenade and main deck is built up of wood. The deck itself is of ⅞-in. pine, covered with canvas and supported by 4¾-in. x 1⅞-in. pine beams spaced 24 in. center to center. The deck is enclosed by a railing consisting of an oak rail, 1¾ in. x 5 in., supported at equal intervals by oak stanchions, the whole being enclosed by galvanized wire iron work. Window stools and sash of cabin windows are of mahogany, while the cabin exterior is finished in redwood, and the interior is finished in white pine covered with white enamel. The souvenir stand is of mahogany, together with the newell posts of stairways and the wood finish around the pipe stanchions.

The Boat Deck

The boat deck extends from frame 17 aft to the extreme stern. The deck forward carries the usual pilot house and chart room together with accommodations for the captain, owner, maid and mate. The stack casing, 7 ft. 6 in. wide, extends from frame 31 to 41. Aft of frame 42 there are four life boats. The stairs leading to the promenade deck are located between frames 72 and 75. The entire deck is enclosed by a ¾-in. pipe railing about 2 ft. 9 in. above the deck, supported by ¾-in. pipe stanchions placed at 5 ft. intervals. The support for the deck is arranged for in the same manner as the promenade deck. The deck is of ⅞-in. pine covered with canvas. The beams are of pine, 1⅜ in. x 4¾ in., spaced 25 in. center to center, the camber being 6½ in. in 32 in. The texas is finished in redwood, while the sash for the windows is of mahogany.

Auxiliary Machinery

All auxiliary machinery is placed below the main deck with the exception of the dynamo and hand deck pump, which are placed on the main deck.

A steam cylinder, 7 in. diameter and 12 in. stroke, is used for reversing each engine and is bolted directly to their respective front columns. A slide valve of cast iron governs the action of this cylinder.

A single-acting, independent, vertical air pump and jet condenser is fitted, having one steam cylinder 12 in. diameter placed directly over the air chamber, 24 in. diameter, with a common stroke of 18 in. The diameter of the injection pipe is 5 in., while the overboard discharge pipe of the air pump is 10 in. All independent pumps are furnished by the Dean Brothers Co., Indianapolis, Ind. The air pump is placed athwartship, the center being 9 ft. 5 in. aft of the center of the engine, the base resting upon the ship floors.

The feed water heater is located on the starboard side on the forward engine room bulkhead and uses the auxiliary exhaust steam. This heater is a No. 5 Schutte & Koerting film feed water heater consisting of eight spirally corrugated tubes, 2⅜ in. diameter by 46 in. long.

There is one 10 x 6½ x 12 independent, simplex, plunger, horizontal feed pump. It is located on the port side of the engine room and has a discharge of 2½ in. diameter, while the suction connects with a 4 in. two-valve manifold which draws from the hotwell and sea.

Service, Sanitary and Bilge Pumps

There is one 8 x 5 x 12 independent, duplex, plunger, horizontal general service pump placed on the starboard side of the ship. The suction of this pump is connected to a 4-in. three-valve manifold which draws from the sea, bilge and hotwell. The discharge, 2½ in. diameter, is connected to the general service pump manifold, through which the pump discharges indirectly to the ash gun, fire hose, deck hose, engine hose, condenser, overboard, fresh water tanks, to the boilers through the feed water heater and to the boiler direct through independent lines. A No. 14½ model

"O" Metropolitan injector discharges into the after end of this manifold.

There is one 4 x 3¾ x 5 independent, duplex, piston, horizontal fresh water pump placed on the starboard side of the ship on the forward engine room bulkhead. The suction and discharge are, respectively, 2 in. and 1½ in. The suction and discharge are connected to the fresh water tanks, which are placed in the boiler room.

There is one 5½ x 5 x 5 independent, duplex, piston, horizontal sanitary pump placed on the starboard side of the ship and whose suction is taken from the sea. The suction and discharge are, respectively, 3 in. and 2 in.

There are two dependent, horizontal, plunger bilge pumps, 4½ in. diameter by 4-in. stroke, each pump deriving its motion from a pin driven into the forward end of the crank shaft. The pump body is bolted to the outboard side of the bed plate of each engine, the suction, 3 in. diameter, is connected to the bilge, while the water is discharged through 2½-in. pipes directly overboard.

There is a double-cylinder 5 x 5½ steering engine, steam and hand combined, made by the Hyde Windlass Co., Bath, Me., and placed on the port side of the ship, connecting with the rudder quadrant by means of chains.

Electrical Equipment

There is a 25-kilowatt Crocker-Wheeler generator direct-connected to a Terry steam turbine, which furnishes current for lighting the ship. This outfit is placed on the main deck, starboard side, just aft the engine platform. The switchboard is placed on the port side near the entrance to the engine platform, the whole being within the engine well.

The ash gun is placed at the starboard side of the ship on the forward side of the coal bunker bulkhead. The gun consists of the hopper into which the ashes are thrown and there discharged overboard through a 7-in. extra heavy pipe, check valve and deflector, which is riveted to the side of the ship. A water jet at the top and bottom of the gun furnishes the necessary power to discharge the ashes.

There is one vertical, duplex, plunger hand pump, required by the United States laws, placed on the main deck, aft. Each cylinder is 4¾ in. diameter with a stroke of 6 in., making a total capacity for each cylinder 106 cu. in.

The Thousand Islander carries life saving equipment for 1,000 passengers.

The Monitor Type of Vessel

By Arthur H. Haver

The special feature of the "Monitor" type of vessel is the application of two corrugations on the outside of the ship.

They are in the form of two horizontal projections between the load waterline and the bilge, and extend along the main portion of the vessel until they merge into the ordinary form of ship's ends.

Their effect in a way is to subdue the waves, making a more seakindly vessel. When the ship rolls the amplitude of the roll is reduced, whilst the period of roll is increased. This action is also felt in the fore-and-aft pitching and 'scending.

The form of the corrugations, whilst adding to the displacement and wetted areas, has the important effect upon the ship that it requires less expenditure of horsepower and coal consumption to propel her at a given speed when compared to a plain vessel of identical dimension, form and fineness. The corrugated form of the shell has considerably more inertia and strength, so that the stiffness is enormously increased in every direction, lateral, vertical or horizontal. Vibration is, therefore, practically unknown in all weather. Unlike plain ships of any type or form, this side increases in strength as she heels over, and when carrying different cargoes, such as iron ore, the easy action is marked and rendered as comfortable as ordinary vessels with ordinary cargoes, the action of the corrugation reducing the roll in the same manner as bilge keels.

The strong form of side, giving greater ability to resist crushing strains or blows from impact, makes a firmer, truer and more rigid side, so that the thickness of shell need not be so great and the supporting frames need not be so numerous.

Two vessels have been built and are satisfactorily working, whilst three others are building.

From the experience gained, extending over two and three-quarter years, it has been proved conclusively, and is now admitted by the profession, that this type of vessel can economize 16 per cent of coal and horsepower, whilst carrying about 3 per cent more displacement, which is equivalent to 20 per cent reduction as compared with ordinary vessels of the same dimensions, form and fineness, and with the same propeller and engines.

The size of the two vessels built, the Monitoria and Hyltonia, is 279 ft. by 42 ft. by 20 ft., 7½ in., 18 ft. draught, and, instead of requiring about 780 i. h. p. for 8¾ to 9 knots, they are propelled, although carrying 100 tons more displacement, with only 630 to 650 i. h. p., which means a saving in coal per day of between two and three tons.

This economy of working admits of the vessel carrying extra remunerative cargo by the amount of the saving in the cost and the weight of coal not put on board, so that on a round voyage the cargo on which freight is paid is something like 6 per cent in excess of that of a similar plain ship.

Finally, there is not a vessel on the market, patent or otherwise, but is capable of being further improved by the application of corrugations, in making a stronger, more economical and better seagoing vessel. When the designers of a plain-sided vessel have exercised all that ingenuity and skill can suggest to make her a perfect vessel, it is still possible by adding these corrugations further to improve her.

The greatest obstacle the pioneers of this type have met with is the conservatism of many who think these facts are impossible of attainment, because the prevailing theories fail to account for them. Yet those who have closely inquired into the improvement have, without exception, been convinced of its truth and accuracy, and that it is in no way opposed to true theory.

It is announced that the Cunard Line has decided to appoint a "staff captain" for the express liners Mauretania and Lusitania. The duty of the staff captain will be to maintain discipline, conduct boat drills and have the management of the crew under his direction. This officer will also assume full charge at any time that the captain may be ill or exhausted. This move is in the direction of greater safety, as with greater ships comes greater responsibility, and it is presumed that the staff captain will be of equal ability to the captain of the ship.

The steamer Forest City, which formerly ran between Cleveland and Port Stanley, has been transferred to Lake Superior and will run between Fort William and Isle Royale, being operated by the Lake Coast Trading Co.

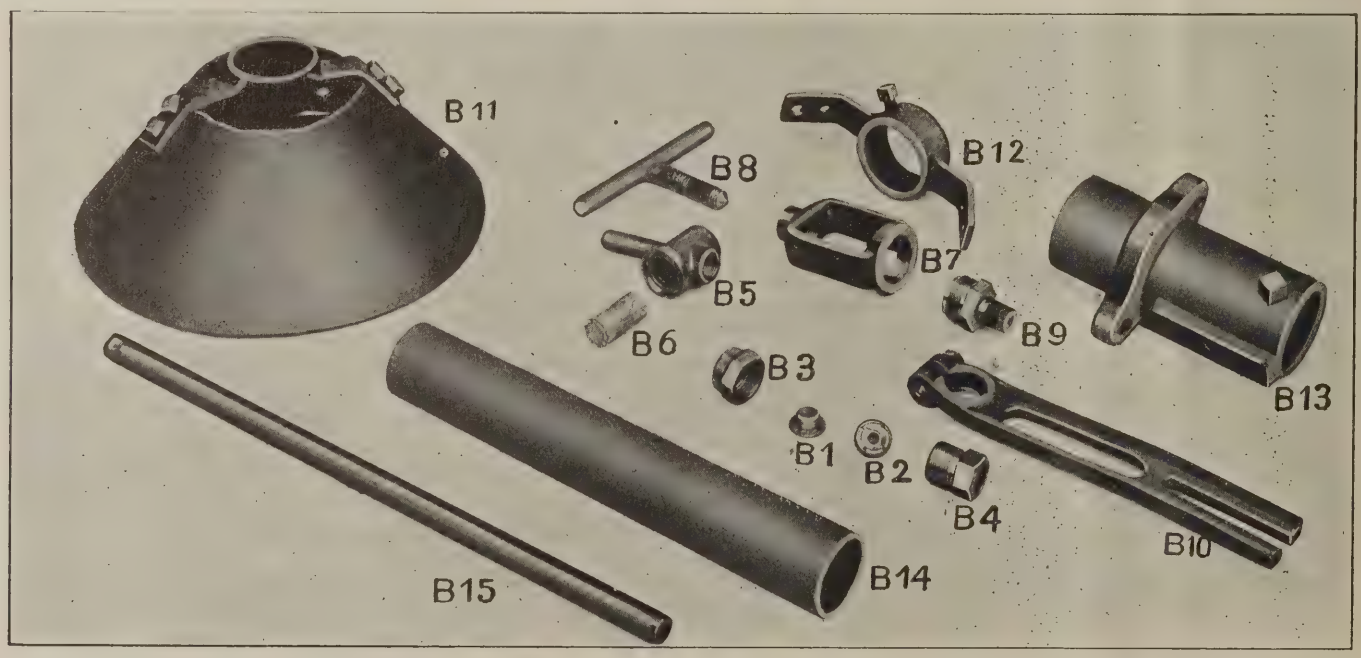
Dahl Oil Burning System

Description of a System Which the Union Iron Works Has Installed on a Number of Pacific Coast Vessels

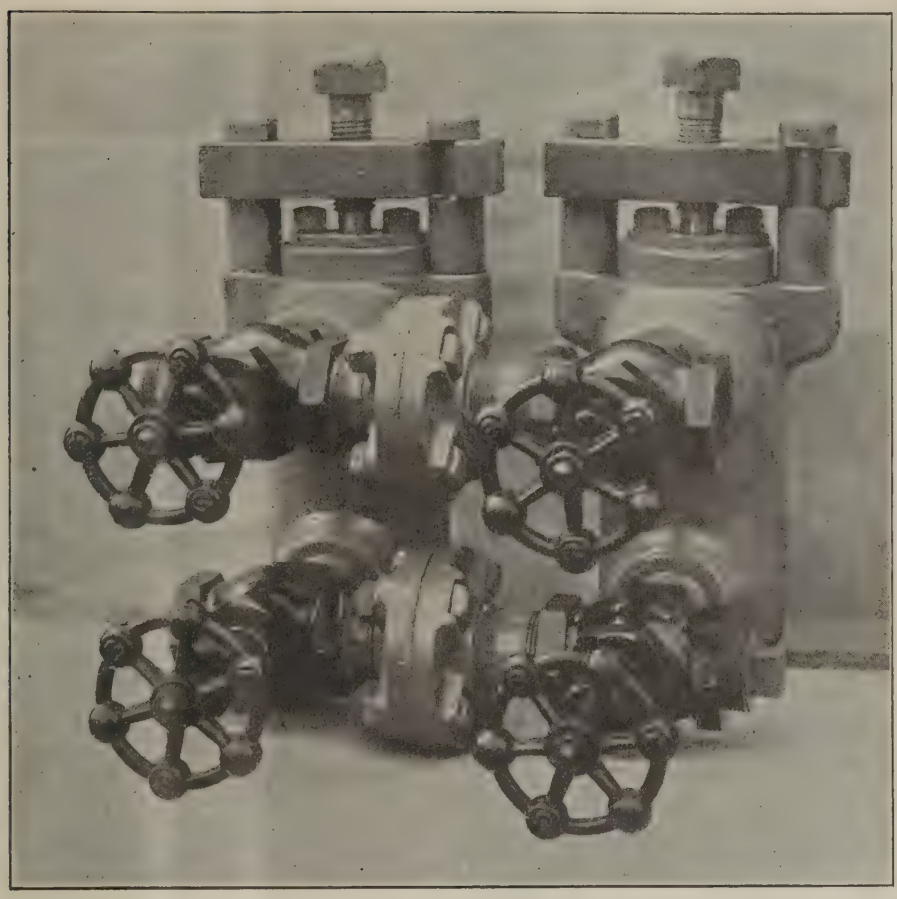
Steamer Kilauea, Fitted with Dahl Oil Burners

LIQUID fuel generally used in firing of boilers is the crude petroleum, ranging in density from 10 to 20 per cent baume. To burn crude oil in a mechanical oil burning system it is necessary to heat it to a degree near its flash point and by means of pumps force it through some mechanical contrivance in order to break it up into small particles, when it is ready to ignite and form a constant, iridescent flame, resulting in complete combustion.

The mechanical perfection of the apparatus used in delivering the oil to the furnace is the most important factor in oil burning. Nearly all oil burning systems have had the same requisite parts as the Union Iron Works mechanical oil burning system, that is to say pumps, heaters, strainers, piping, valves and burners, but in addition it is generally customary to use some foreign agent to atomize the oil, such as compressed air or live steam. It is true there are a number of mechanical oil burning systems on the market which have been more or less successful with the lighter oils, but which have not been satisfactory where only the heavier oils



One Complete Oil Burner Set—B1, Tip; B2, Atomizer; B3, Atomizer Nut; B4, Clamping Nut; B5, Strainer Sleeve; B6, Strainer; B7, Yoke; B8, Handle; B9, Nipple; B10, Bracket; B11-A, Regulating Cone; B11-B, Regulating Cone; B12-A, Casting for Cone; B12-B, Casting for Cone; B13, Nozzle; B14, Adjusting Pipe for Cone; B15, Burner Pipe



UNION IRON WORKS' AIR COMBINED DISCHARGE STRAINERS

could be readily obtained.

The use of air and steam has been eliminated in the Union Iron Works mechanical oil burning system, doing away in the first place with large compressors with their piping, etc., which occupy much valuable space in vessels; and in the second place abolishing the use of live steam. On most vessels, this latter is a very serious item. The steam used for atomizing (which usually amounts to from 3 to 5 per cent of all steam generated), and this water being blown up the stack renders it necessary to either carry a large amount of water or to install an evaporator to make up the loss. In a stationary plant where water has to be purchased by meter or where water is very difficult to obtain, it can readily be seen that a practical mechanical oil burning system is of great advantage.

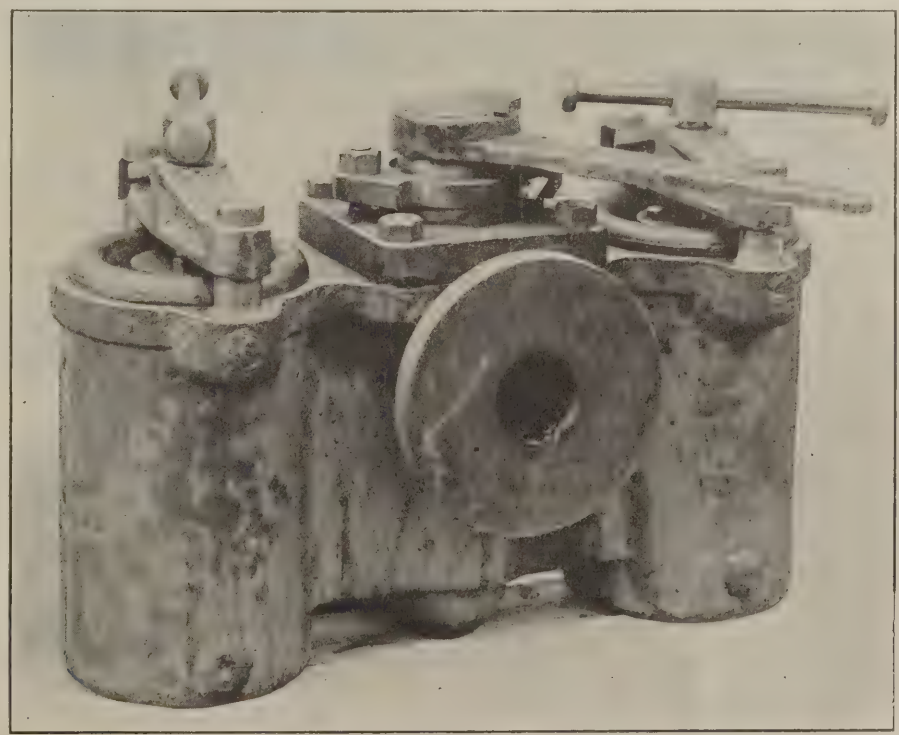
The burner is simple and has few parts. It has no moving parts at all to clog and get out of order and is well protected by strainers should any foreign matter get to the tips. In the suction to the pumps are the duplex strainers that take care of the large particles that may be in the oil, thus protecting the pumps. In the discharge from pumps to the heaters are the duplex discharge strainers that protect the heaters and before the oil enters the burners it passes through still another fine strainer to protect the tip from clogging.

The Dahl Mechanical Burner

The precautions taken to cleanse the oil of any foreign matter insure longer running without examination. The Union Iron Works' burner has been run for thirty-six hours under the most adverse conditions without the tips becoming clogged in any way or requiring to be cleaned.

The oil burning systems of the past have used a great variety of burners, which have necessitated an atomizing agent, such as air or steam, which, in turn, in the case of air atomization, meant the installation of an air compressor, or with steam atomization an evaporator of sufficient size to make up the deficiency in the feed water. This meant quite an expenditure, not alone in first cost, but in maintenance and repairs. It was discovered that by heating the oil to a high temperature and forcing it through a suitable burner tip under pressure, it could be perfectly atomized. The Union Iron Works experimented for some time on such a burner, and has at last produced one which is covered by the Dahl patents.

By a mechanical oil burning system is meant a system that requires neither steam nor air for atomizing the oil. The oil, after being heated to the proper temperature, is forced through the burner at the required pressure, the passages in the burner being such that the oil is thoroughly broken up before being discharged, so that it immediately volatilizes, and a perfect flame is obtained as soon as the oil leaves the burner. The pressure under which the oil is forced through the burner and the size of the tip regulate to a nicety the exact amount of oil that can be burned. The quantity of oil can be varied to some extent by



UNION IRON WORKS CO.'S COMBINATION SUCTION STRAINERS

the pressure, and more by the size of the tip used in the burner.

The furnace front is of approved construction and so arranged that the burner passes through a pipe, on the end of which is a cone or deflector, which can be adjusted by moving it in or out to secure the proper quantity of air just where it is needed. The front is extended, so that the whole length of the furnace is utilized, and the brickwork is so fitted that repairs and examinations can be made without removing it.

In the case of boilers already having extended fronts similar to those used with the Howden system very little change is necessary to adapt them for receiving the new system.

The pressure of the oil can be varied from 30 lbs. to 200 lbs. to the square inch, and the temperature may be varied from 150 degrees F. to 260 degrees F.

Simplicity of the System

The system consists primarily of a pump, heater and burner, although in practice two pumps and two heaters are fitted, so that in case of a breakdown, or in case of overflow there will always be one pump and one heater in reserve.

Every care has been taken to make the system as simple and as nearly "fool-proof" as possible. In addition to the advantages claimed in ordinary practice, the system is absolutely noiseless, and therefore has this recommendation for its adoption on passenger steamers, ferry-boats and steam whalers.

The Union Iron Works Co. has protected its invention in all parts of the world and is now able to publish some of the data obtained on the first vessels that have been fitted with their system.

Leading marine engineers, whose opinions on technical questions are highly valued, say that the oil-burning system as fitted by the Union Iron Works Co. marks one of the most important steps in solving the problem of fuel for ocean-going steamers.

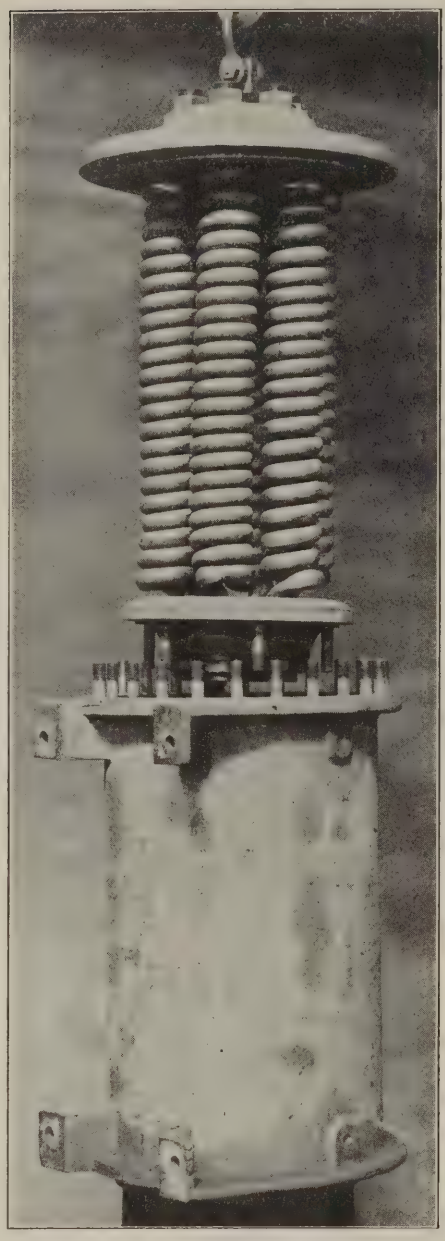
The system is just as efficient in melting or heating furnaces, stationary boilers, or, in fact, anywhere where fuel is burned in a furnace.

All parts of the system have undergone a gradual development and where a slight defect has been discovered it has been rectified, or where improvement could be made it has been done in order to make the system as complete and efficient as possible.

The Union Iron Works system, although comparatively new, is now operating plants with a collective indicated horse power of over 200,000.

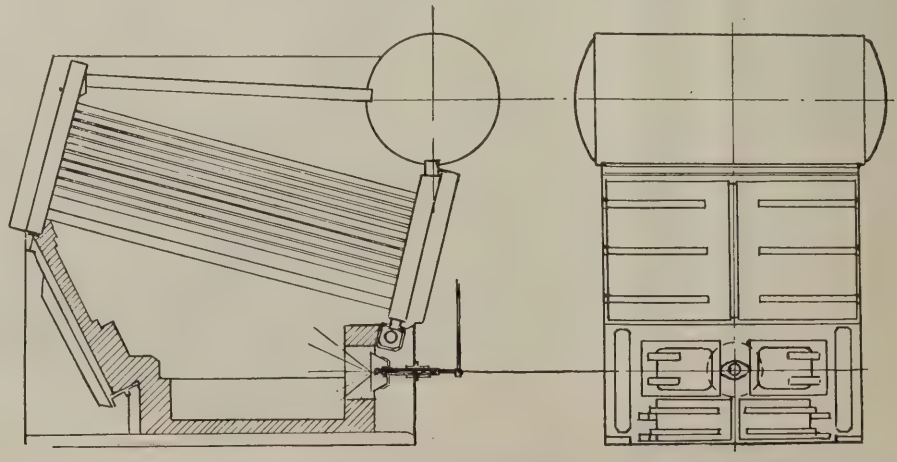
Method of Operation

The Union Iron Works Co. has issued the following instructions as to the method of operating mechanical oil burners:



REMOVING COIL, NO. 6 HEATER

Inspect the entire system, especially the strainers. See that the baskets are clean and in place. With burner valves closed and the valve at the end of the oil line open, start the pump slowly to allow the oil to circulate back to the suction line. Open steam to heater and drain same. Close the drain on heater until it is just open enough to allow the condensed water to escape to tank and regulate the steam valve to keep the temperature steady. When the thermometer registers 180° to 200°, close the oil valve at the end of the line and open the valve on the burner. The pressure gage on the line should register 30 lbs. or above, and with a lighted torch under the burner the oil will ignite. Push the regulating cone as far in the furnace as possible and then gradually withdraw same until the edge of it clears the flame. Do the same with all furnaces. Keep the temperature of the oil as near as possible at 220°. The pressure on the oil pump should be about 60 lbs., and should the fires not be large enough increase the pressure to 200 lbs., but do not exceed that. It is of great importance that the burners be kept clean as the passages are very small, and a dirty burner causes smoke and a deposit of carbon in the furnace. Whenever the carbon appears in the furnace, change the burner and break off the carbon from the sides of the furnace with a small bar through the lighting hole, and with a clean burner working properly it will burn up. Whenever a fire is burning one-sided, sparking on one side, or showing black streaks, it is a sign that the burner needs cleaning. It is well to have a can of coal oil in the fireroom in which the tip, atomizer or strainers may be washed before returning to their place. When a new system is installed, it should be thoroughly blown out with steam before allowing the oil to enter the pipes. In making the joints, there is always a certain amount of dirt and grit which gets into the pipes, and this should be entirely gotten rid of before lighting the



ARRANGEMENT OF FURNACE AND BRICKWORK FOR BABCOCK & WILCOX WATER TUBE BOILER (MARINE TYPE)

DAHL PATENT OIL BURNER

fires. If the oil is allowed to get too hot, over 200 F., gas will accumulate in the oil line causing the fires to burn unsteady and flicker. To overcome this, open the valve at the end of the oil line slightly for a few seconds to allow the oil to circulate back to the suction and allow the gas to escape.

The table accompanying this article shows the marine installations which the Union Iron Works Co. has made of the Dahl system during 1911 and 1912.

Dredger for Burma

Wm. Simons & Co., Renfrew, launched from their yard last month the dredger Campbell, built to the order of the Indian government for the improvement of the waterways in Burma. This dredger, which is of the "Simons" suction reclamation type, has been specially designed and constructed under the direction of Prof. J. H. Biles, naval architect and consulting engineer to the India office. The Campbell is a twin-screw light-draught cutter dredger and will work in conjunction with a floating pipe line and terminal pontoon, arranged for delivering dredged material over river or canal banks for land reclamation.

The dredging pump is driven by an independent set of triple-expansion engines and the suction pipe is carried on a frame fitted in well at forward part of vessel. The lower end of suction frame is fitted with a steel spiral rotary cutter, driven by cast steel machine cut gearing from a set of horizontal compound engines placed on deck. The gearing and cutter are of ample strength to stall the engines when working at full power. Independent steam hoist gear is provided for controlling the suction frame, and very powerful maneuvering winches are placed at each end of the vessel. An operating house is provided on upper deck containing all necessary levers and telegraphs to enable one man to have complete control of the dredging operations. The dredger is propelled by twin screws, each driven by a set of triple-expansion engines. Steam is supplied by two cylindrical multitubular boilers, constructed to Lloyds requirements for a working pressure of 160 lb. The boilers are fitted with Howden's forced draft for burning Indian fuel. A complete installation of condensing plant capable of dealing with exhaust steam from all the engines in the vessel at one time, independent automatic feed pumps, bilge pumps, service pumps, pressure pumps, filters and all the other usual auxiliaries for a vessel of this tye, are provided in engine room. A repair shop with electrically-driven machine tools capable of overtaking minor repairs, is fitted on board. Electric light installation is provided both above and below deck. The vessel is provided with every accommodation necessary for a crew working in a hot climate.

The contract for converting the six-masted steel schooner William L. Douglass, which was sold recently by the Coastwise Transportation Co. to the Sun Co., Philadelphia, into an oil-carrying barge, has been awarded to Cramps, Philadelphia.

STEAMERS FITTED WITH OIL BURNING SYSTEM

Name.	No. Boilers.	No. Furnaces.	Total H. P.	Size of Engine.
Maverick	2	6	1,300	25″-41″-67″x51″
City of Para	6	12	1,700	28″-44″-70″x48″
Pennsylvania	2	8	1,200	22″-36¼″-60″x36″
Aztec	2	6	1,400	24″-40″-66″x45″
Barge No. 95	1	2	.....	.....
Leelanaw	2	6	800	22″-35″-58″x42″
Pectan	6	18	2,800	29½″-48″-78″x54″
Oleum	3	9	2,300	18″-28″-45″x30″(T.S.)
Kilauea	4	12	2 600	25″-41″-48″-48″x30″
Mauna Loa	2	4	1.000	15½″-26″-43″x33″
Sonoma	8	24	8.000	28″-46″-75″x48″(T.S.)
Ventura	8	24	8,000	28″-46″-75″x48″(T.S.)
Union Tug	1	1	75	9″-17″x12″
Prince George	4	18	6,000	23½″-37″-41″-41″x33″(T.S.)
Prince Rupert	4	18	6,000	23½″-37″-41″-41″x33″(T.S.)
Yukon	2	4	800	.....
Venetia	2	4	800	16″-22″-42″x25¾″
Buckman	3	6	1,500	22¾″-37⅞″-63″x40″
Watson	3	6	1,500	22¾″-37⅞″-63″x40″
Princess Beatrice	2	6	1,400	18½″-30″-50″x36″
Al-Ki	2	4	800	22⅜″-44″x36″
Baramba	2	2	600	Locomotive boiler.
Wilhelmina	6	24	7,000	35″-58″-69″-69″x60″
Britannia	1	2	300	10″-16″-25½″x16″
Rose City	6	12	1,900	28″-44″-70″x48″
Bear	6	18	3,700	31″-50″-84″x54″
Beaver	6	18	3,700	31″-50″-84″x54″
Princess Adelaide	4	12	5,000	.....
Asuncion	2	6	1,400	B. & W. boilers.
Pacific	2	4	250	Risdon W. T.
California	2	6	3,000	.....
Wilson Lumber Co.	2	6	.....	Scotch boilers.
Caledonia Dredge	2	2	600	Springfield dryback boilers.
Dredge	3	3	1.434	Parker boilers.
S. S. Atlas	2	6	1,700	21⅝″-34″-56″x42″
Dan E. Erickson	1	3	400	Scotch boilers.
Barge No. 91	1	2	300	Scotch boilers.
Olsen Mahoney No. 3	2	6	1,700	.....
Union Freight Steamer	2	6	.....	.....
S. S. Ashtabula	4	12	3,000	28¾″-46½″-77″x54″
S. S. Princess Victoria	6	18	6 000	.....
Whaler Kodiak	1	2	400	.....
Whaler Unimak	1	2	400	.....
S. S. Grace Dollar	1	2	350	10½″-18″-30″x24″
S. S. Capt. A. F. Lucas	2	8	2,550	25″-41½″-68″x42″
S. S. Arrow	1	1	.....	.....
Tug Point Grey	1	3	700	.....
S. S. Princess Patricia	One O. E.	8	4,000	Parsons steam turbine.
S. S. Jefferson	3	9	1,400	.....
S. S. El Segundo	2	8	2,200	Scotch boilers.
Sulphur Boat Freda	2	6	.....	Scotch boilers.
S. S. Chelohsin	2	6	1,600	.....
S. S. Princess Sophia	3	9	.....	.....
S. S. Col. E. L. Drake	2	8	2,350	25″-41½″-68″x42″
S. S. Richmond	3	9	3,100	23″-32¾″-49″-71½″x51″
S. S. Venture	2	6	1,500	Twin screw.
Gov. Tug	1	2	400	.....
S. S. Portland	2	4	1,000	Scotch boilers.
W. R. Grace & Co.	3	6	2,500	Scotch boilers, triple expansion engine.
S. S. Princess May	.	..	.....	.....

Ice Breaking Tug James Whalen

The ice-breaking tug James Whalen which was constructed by the Bertram Engine Works, Toronto, has attracted more or less attention since she went into commission in 1905. Her leading dimensions are: Length over all, 108 ft.; length between perpendiculars, 98 ft.; breadth molded, 24 ft.; depth at side, 14 ft. 5 in.; mean draught light, 10 ft.; mean draught with water ballast, 13 ft.; gross registered tonnage, 313.4; net registered tonnage, 156.26.

The Whalen is built of steel throughout with water ballast forward and aft, her shell plating being double for half her length from stem. The frame spacing is 24 in. to within 14 ft. of stem, the forepeak being 15 in. and the balance 18 in.

She is equipped with fore and aft compound engines, 20 and 40 in. cylinder diameters x 36-in. stroke, supplied with steam from Scotch boilers, 12 ft. 6 in. diameter and 12 ft. long, allowed 156 lbs. pressure. Her bunkers have a capacity for 100 tons of coal. She has four pumps, 8, 5 x 12; 6, 3½ x 7; 6, 4 x 7, and 4½, 2½ x 4. Her towing machine is 14 in. x 16 in. She is equipped with a 5 k. w. electric plant, steam steerer, searchlight and gasoline launch.

During the winter of 1912, she broke ice 57 in. thick at the dry dock at Port Arthur. She keeps the harbor of Port Arthur and Fort William open, as well as a channel 25 miles long to open water all winter. The Whalen carries a crew of eleven men with accommodations for as many more. She has a passenger license. During the season of navigation she works in conjunction with three large wrecking barges equipped with wireless and two 20-ton derricks on each, as well as a full line of wrecking pumps and air compressors. These barges are capable of carrying 1,500 tons. The whole wrecking outfit can be got in readiness for work on an hour's notice.

TUG JAMES WHALEN BREAKING 4 FT. OF ICE

Decade's Wastage of Steel Vessels

During the past ten years, 29 iron and steel vessels have become total losses on the great lakes. These vessels include the iron steamers Clarion and Russia, and the British-built steamers Turret Cape, Theano, Bannockburn, and the Canadian - built steamer Ottawa.

Of course, there have been total constructive losses of steel vessels as well, notably the steamer E. L. Fisher, which was sunk in Detroit river, but as these have been raised, repaired and placed in commission again, no attention has been paid to them.

It will be observed that the loss of steel tonnage, considering the number of ships and the volume of freight moved during these years, was not large. Some of the losses, of course, were unavoidable, as for instance those which were swept on the north shore of Lake Superior, during the great storm of 1905. It must be admitted, however, that some of them were avoidable and would not have occurred at all, had the rules of navigation been carefully observed.

Five of the losses have elements of mystery about them which will never be solved. No one knows what happened to the Bannockburn in 1902, the Cyprus in 1907, the Clemson in 1908, the car ferry Marquette & Bessemer No. 2, in 1909, and the car ferry Pere Marquette 18, in 1910. No one came ashore from the Bannockburn, the Clemson or Marquette & Bessemer No. 2 to tell the tale. One man came ashore from the Cyprus, but gave no responsible reason why this steamer should have foundered in a sea that was not disturbing much smaller craft. But the greatest mystery of all was the foundering of the car ferry Pere Marquette 18, in which 32 members of the crew were actually saved and not one of them knew what had happened.

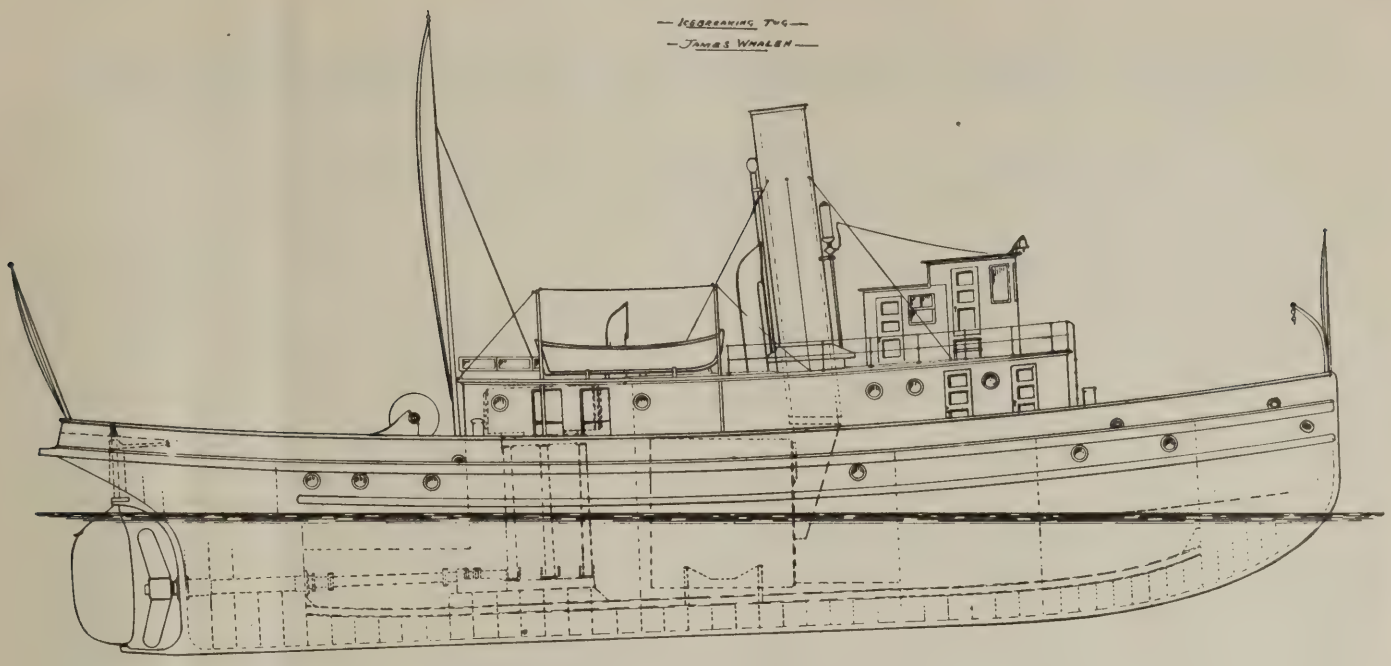
Following is the table:

	Name of Vessel.	Carrying capacity, gross tons.
1911—Str.	Joliet	2,777
	Str. John Mitchell	7,500
	Str. Turret Cape	3,100
1910—Str.	Frank H. Goodyear.	6,900
	Str. W. C. Moreland	12,000
	Str. John Sharples	2,800
	Car Ferry Pere Marquette No. 18	5,090

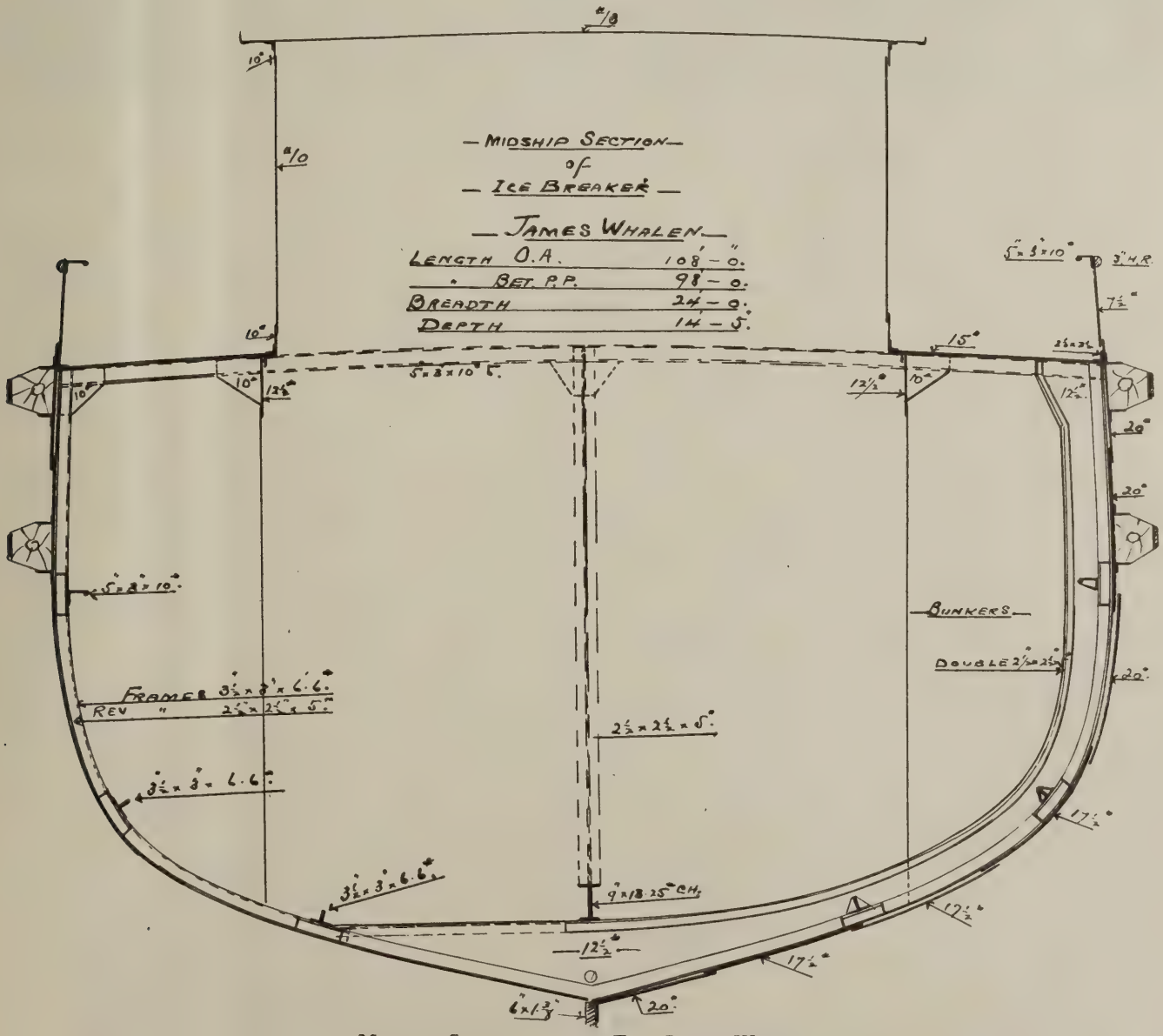
		Carrying capacity, gross tons.
1909—Str.	Aurania	4,500
	Str. Clarion	3,000
	Str. John B. Cowle	6,500
	Str. Ottawa	3,500
	Str. Russia	2,800
	Car Ferry Marquette & Bessemer No. 2	.....

		Carrying capacity, gross tons.
1908—Str.	D. M. Clemson	7,800
	Pkg. Frt. North Star	3,000
1907—Str.	Cyprus	7,000
1906—Str.	Grecian	3,255
	Str. Theano	2,600
1905—Str.	Sevona	4,500
	Str. Etruria	6,250
	Str. Thos. W. Palmer	3,100
	Str. Lafayette	6,588
	Sch. Madeira	7,000
	Str. Vega	3,272
	Str. Ira H. Owen	2,900
1904—None.		
1903—Str.	Queen of the West.	1,500
1902—Whaleback barge	129	2,500
	Str. Bannockburn	3,000

The John Rohan Boiler Works Co., of St. Louis, are building a sand dredger for L. H. Yourtee, of Chester, Ill., 100 ft. long, 20 ft. beam and 4 ft. 6 in. deep.



OUTBOARD SECTION OF THE TUG JAMES WHALEN



MIDSHIP SECTION OF THE TUG JAMES WHALEN

New Hamburg-American Liner

The Leading Features of the Imperator, the Largest Ship Ever Built in Germany and at Present the Biggest in the World—A Floating Palace

The passenger steamer Imperator, now being constructed in the yard of the Vulcan-Werke, in Hamburg, for the Hamburg-Amerika Line, excels in size any ship afloat. This is the first large passenger steamer launched from the Vulcan company's works, at Hamburg. The Vulcan company, however, has great experience in the building of such leviathan liners, most of the famous German liners having been constructed at their well-known works at Stettin.

The main dimensions of their latest leviathan are:

Length, 880 ft.; breadth, 98 ft.; depth, 35 ft. 6 in.; gross tonnage (approximate), 51,000 tons; launching weight, about 26,500 tons; speed at sea, 22 knots.

Passenger Accommodations

The hull is constructed with a double-bottom, which, in accordance with the German Lloyd regulations in the case of first-class ships, is about 6 ft. 7 in. high, and extends right fore and aft, seven steel decks within the molded structure, another deck partially of steel, and three steel-plated superstructure decks. Thirty-six water-tight compartments are provided, so that in the case of the most serious damage the vessel would still float. The doors necessary for communication in the transverse bulkheads, which are as limited in number as possible, are hydraulically closed on the Lloyd-Stone system. In emergencies they are closed simultaneously from the conning-bridge, but may each be opened at the station, although the door again automatically closes within a short period, provided the gear on the bridge is in the closed position, and at all times the state of the door is indicated on a disc on the bridge. Each individual door, too, can be closed independently from the upper deck by a mechanical contrivance. In addition to complying in these and other respects with the regulations of the German Lloyd, the ship is in all details equipped in conformity with the most recent regulations of the German Auswanderergesetzes, the German Seeberufsgenossenschaft, the American and English laws, and the German Seemannsordnung.

The number of passengers for whom provision is made is as follows: First class, about 700; second class, about 600; third class, about 940; and fourth class, about 1,750, of which 1,000 are in rooms and 750 are in several large compartments. The crew numbers about 1,100. Thus the total number of persons on board when the ship is full will be about 5,100. All the cabins in the ship are of unusually large dimensions, and every care has been taken to insure the convenience of all passengers, as well as of the crew. In addition to the ordinary large first-class cabins several special suites are provided, consisting of sitting room and bed room, with bath and, in addition, there are two elegant suites, so-called "imperial" suites, consisting each of a saloon, a breakfast room, two sleeping rooms and two bath rooms. For general use there are provided for the first class passengers two main saloons, a restaurant and winter garden—exact replicas of those at the Carlton hotel, large hall, ladies' room, smoking room, veranda cafe, and a large swimming bath, identical with that at the London Automobile Club. In addition there are hygienic, warm and hot air, steam, electric and carbonic baths, one room for cold water treatment, one massage room, and one large and convenient resting room. For the passengers of the second class there is a large dining saloon, smoking saloon, social room, hall and a gymnasium. For the passengers of the third class dining, smoking and reading rooms; and for passengers of the fourth class a large dining room. There are promenade decks of ample area for all classes of passengers. Comprehensive cooking and domestic arrangements on the most practical basis are provided. Kitchens, pantries and sculleries are to be fitted for all classes of passengers, and these are equipped with the most recent and requisite contrivances, including bakeries, confectionery and butcher's departments. The provision spaces are extremely large, and cold stores are provided for the provisions.

Trim Appearance of Vessel

A light schooner rig, consisting of two masts, combined with three huge funnels arranged between the masts, gives the ship a sightly appearance. Both masts are equipped with loading and unloading apparatus to an ample extent, and electric cranes are fitted for the rapid and convenient handling of loads. The anchor and mooring arrangements for the ship are of a size to correspond with its great bulk. The weight of the anchor and chain amounts to about 200 gross tons, the diameter of the metal of the individual links being 3.94 in. For rescue work the safety arrangements are on the largest scale, and each person is to be provided with a life belt and life buoy, which, by means of electric contact with the navigating bridge, can be distributed in great numbers. Owing to the number of boats provided on the vessel—100—the means of safety for the passengers is most favorable. In respect to boat-launching, the most suitable design has been adopted. As with all new ships, the arrangements for wireless telegraphy are extensive, and there are fitted submarine signaling appliances.

The electric installation includes five turbo-dynamos for a lighting circuit comprising about 10,000 lamps, and for a power circuit to run motors of a collective horsepower of 850. There are, for instance, four passenger lifts, several provision lifts, post and packing arrangements, four rotary cranes for picking up the provisions and luggage and working the life boats. Further, the mechanical appliances in the kitchens and pantries are electrically worked. The installation in the conning tower, the telegraph and heating apparatus, dock and rudder telegraphs, are also electrically worked. There is a loud-speaking telephone installation, which connects the various rooms with each other, as well as provision of electric clocks, electrically worked from the chief clock on the bridge, and also an electric alarm, which is capable of arousing the entire crew by operation from the conning tower. In addition to the large electric generating installation there is a generator on the top deck, which, in case of breakdown of the main installation would supply current for lighting the gangways, the most important of the work rooms and all of the boat decks. This set also supplies the current for working the installation on the con-

A REMARKABLE PHOTOGRAPH OF A MONOPLANE FLYING OVER THE BRITISH TORPEDO DESTROYER SWIFT AT SPITHEAD—THE SWIFT IS THE LARGEST AND FASTEST DESTROYER IN THE WORLD

ning tower and the wireless telegraphy apparatus. The dynamo in this case is driven by an internal-combustion engine, so that its working is secure even in the event of the flooding of the boilers, in the stokeholds. For the convenience of the passengers an electric bell installation is fitted.

Precautions Against Fire

In order to afford security in case of fire, there is a fire station, and a recording apparatus on the Rich system on the bridge announces the outbreak of fire, and through its telltale tubes from each hold or compartment steam can be forced to extinguish the fire at the moment of outbreak. Moreover, water extinction is provided for throughout the ship with a large number of fire hydrants. On the passenger decks iron fireproof doors are provided in considerable numbers, to prevent fire passing from one division to another.

Complete ventilation is provided for in all state and public rooms. There are for this purpose about 80 "Sirocco" ventilators, of a total of about 19,000 cu. m. capacity. The rooms of the fourth class are provided with thermo-tanks for ventilation and heating. In addition there is an abundance of natural ventilation. An ozone installation is introduced to sweeten the air of the rooms. To avoid rolling in heavy seas, which happens with so many ships, Fram's anti-rolling tanks have been installed.

In order to give an idea of the enormous quantities of the various materials utilized in such a ship, it may be noted that there have been used about 26,000 tons of steel plates, angles, profiles, etc.; 1,400 tons of nuts and screws; 600 tons of cast iron and cast steel; about 6,000 cu. m. of various woods. The weight of the complete sternposts, together with the shaft brackets, is about 175 tons, while the rudder weighs about 90 tons.

Four four-bladed propellers drive the ship, the diameter being about 16½ ft., worked by a turbine installation at a normal rate of 185 revolutions per minute. The individual turbines are arranged so that the steam passes through the high-pressure turbine on one inner shaft, to an intermediate pressure turbine on the other inner shaft, and finally thence to both low-pressure turbines on the outer shafts. Each separate shaft is capable of being worked and maneuvered independently. The reversing turbines consist of two high-pressure and two low-pressure turbines, with the later again on the outer shaft. The largest low-pressure casing has a diameter of about 18 ft. and a length of about 24 ft. 7 in. Two condensers are arranged near to the low-pressure turbines. The water-circulating pumps, four in number, are arranged two each on one engine, which drives both or either. There are a large number of boilers in water-tight compartments, which provide the necessary steam at a pressure of 16 atmospheres.

The city of New York has leased the municipal dock at Thirty-third street, Brooklyn, to the Bush Terminal Co. The Terminal company is to pay the city 95 per cent of the gross receipts monthly, retaining 5 per cent for its service. The dock is to be open to all shipping on equal terms without discrimination, and it is expressly understood that a new line of steamers consigned to and managed by James W. Elwell & Co., a rival dock company, shall be accommodated at the pier.

The Erie Railroad Transit Line which has been heretofore managed as an adjunct of the Buffalo division of the railroad by the division superintendent, will hereafter be managed from the general offices, 50 Church street, New York. Charles S. Goldsborough has been appointed manager with J. C. Maclay as superintendent at Buffalo.

THE MARINE REVIEW

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August, 1912

Panama Canal Bill

During the past month congress has devoted considerable attention to the Panama canal bill, not steadily, but intermittently, as it has been taken up between discussion on various appropriation bills. Great Britain has meanwhile added somewhat to the interest in the situation by sending a note to the state department that the bill in certain of its provisions violates the Hay-Pauncefote treaty. The note apparently is nothing more than this, but it has created quite a furore.

It is unnecessary to recount here the history of the Panama canal. Everyone knows that it was constructed exclusively by the United States at its own expense and through property acquired by it through purchase. The total cost of the canal will be approximately $400,000,000, and it is the expectation that it will be open to traffic in September of next year. It would appear to the layman as though the United States had a greater right in this ditch than any other nation, but there are many who take an opposite view and some of the views are, to say the least, surprising. For instance, it is held that the United States government has not the right to pass American vessels engaged exclusively in coastwise commerce through the canal without the payment of tolls. Great Britain takes this view, and it is apparently shared by others on this side of the water. As the coastwise commerce of the United States is reserved exclusively to the American ship, it is not easy to see in what way other nations are concerned in the case of these domestic tolls. That would appear to be a matter exclusively for the United States government to decide. The right to regulate internal commerce would seem to be the fundamental right of each nation, but after reading all of the speeches delivered in congress with the various interpretations placed upon various phases by scores of speakers, one is inclined to become lost in a kind of fog.

There might be some question as to our right to pass American vessels engaged in foreign trade through the canal free if tolls were levied against other vessels engaged in this same trade, but there can obviously be no question as to our right to remit even those tolls. If Great Britain chooses to pay the tolls on British tonnage using the canal no nation can object. In fact, Spain has already declared its intention of doing this very thing. But our domestic commerce is a totally different thing. Whether we remit or do not remit the tolls on domestic shipping, the right to do either should be unchallenged.

Probably the greatest authority that we have in this country on transportation is Prof. Emory R. Johnson, who holds the chair of transportation and commerce in the University of Pennsylvania. He was a member of the Isthmian Canal Commission from 1899 to 1904, and last year made a special report on canal traffic and tolls at the request of President Taft. He recently prepared an article for the *North American Review*, in which he has estimated the shipping that would have passed through the canal in 1909-10, had the canal been open at the time. His calculations are given in the accompanying table. Analyzing the figures given in the table, Dr. Johnson says that only 11.4 per cent of the traffic passed from one coast of the United States to the other by Cape Horn, the Isthmus of Panama or the Isthmus of Tehuantepec, and that the trade of this country with foreign countries accounted for 32 per cent of the total. The commerce between Europe and the west coast of South America supplied 38 per cent of the traffic which might have used the canal, and the trade of Great Britain alone with the west coast of South America would have supplied one-sixth of the total traffic through the canal in 1910. As the canal will not be open until 1915, it is necessary to increase these figures by the growth in trade that is to be anticipated. Dr. Johnson arrives at the conclusion that in 1915 ships with a total net register of 10,900,000 tons should pass through the canal.

ESTIMATED SHIPPING THROUGH PANAMA CANAL

	Total Entrances and Clearances.
Europe, with Western South America	3,148,400
Western Central America and Pacific Mexico	199,502
Pacific United States, British Columbia and Hawaii	689,718
Pacific United States via Suez Canal	158,000
Oriental countries east of Singapore and Oceania	1,174,585
Eastern United States coast, with Western South America, Pacific Mexico and Hawaii	467,595
Pacific coast of United States, (via Cape Horn)	172,655
Pacific Coast of United States and Hawaii, (via American-Hawaiian S. S. Co.)	363,426
Oriental countries east of Singapore and Oceania	1,500,000
Panama traffic	418,490
Eastern Canada, with Alaska, Chile and Australia	35,658
Total	8,328,029

(1) Not separable into entrances and clearances.

In estimating the amount of traffic which will use the new waterway, Dr. Johnson says that there are two important factors outside of actual distance from

the Isthmus of Panama to be considered. The first of these is the tolls; the second, the cost of coal on the Panama route as compared with other routes. Then he defined the traffic which is for geographical reasons likely to use the canal from that which has a choice between the Straits of Magellan, the Cape of Good Hope, the Suez canal and the Panama canal. He says:

The Panama route will have a monopoly of the traffic of Hawaii and of the west coast of North and South America, with the exception of a small part of the trade of Southern Chile, but it so happens that the marginal traffic for which the Panama canal must compete with other routes is of exceptionally large tonnage and value, comprising the major share of the commerce of Pacific Asia and of Australasia. The ships engaged in the trade of which the Panama route has a monopoly will comprise the larger share of the canal's tonnage, but the marginal traffic is a prize so well worth competing for that it should be given careful consideration in fixing the tolls to be charged at Panama. The volume of traffic and the commercial usefulness of the canal, as well as the revenue obtained from its operation, are dependent upon the transit dues.

Dr. Johnson thinks that a toll of $1.00 a ton will probably be sufficient to divert the commerce between Europe and the central districts of Chili to the Straits of Magellan were it not that vessels engaged in that trade would want the coast trade of South America on their way. Moreover, the Panama route would offer opportunities to buy coal so much more cheaply on the Isthmus or in the West Indies than on the east coast of South America that the difference in the price of fuel would probably be equal to one-half or even more than one-half of the canal tolls.

The canal, under any tolls it is likely to impose, will probably obtain the trade between the Atlantic coast of the United States and Australia and New Zealand, but for the European trade with Australasia the Panama canal will have serious competition from Suez for fast steamships, and from the Cape of Good Hope for ordinary freight vessels. If the Panama tolls are kept lower than those of Suez, some of this trade should be captured. Concerning the trade with the far east, Dr. Johnson says:

The Panama and Suez routes will be active rivals in the rich traffic field east and north of Singapore. The line connecting points equally distant from New York by way of the opposing routes runs through Hongkong and Manila. To the north and east of those cities the distance and time advantage is with the Panama route for trade of the eastern seaboard of the United States. To the south and west of Hongkong and Manila the Suez route will have the advantage. There will be some traffic from places north and east of Hongkong and Manila that will be taken to New York and the east coast of the United States by way of Suez. It is equally true that vessels will start from points west of Hongkong and Manila and proceed by way of Panama to New York. There will be an overlapping of routes between Singapore and Yokohama.

Dr. Johnson considers that any traffic between Europe and Japan, China, or the Philippines by way of the Panama canal will be attracted because the tolls are lower than those of the Suez canal or because of cheaper coal, and he suggests that the tolls of the new canal be adjusted to try to gain some of this trade. In 1910, there were 12,000,000 net tons of it and it would be a fine thing if the Panama canal could obtain say 20 per cent of this.

The question of coal is an important one and if it is commercially possible to deliver and sell coal at Panama cheaper than it can be procured at Suez, it should have much influence in diverting traffic to this route. Coal at the present time is selling at $6.00 per ton at Suez. He gives the illustration that a freight vessel of 3,000 tons net register made a round trip from New York to the Philippines via Suez, paying $20,868 for coal. Had the same vessel made the trip via Panama and San Francisco, the coal bill would have been $18,220, a saving of $2,648. Dr. Johnson estimates that the traffic on the canal will increase 60 per cent every decade. At that rate 17,000,000 tons net register will be using the canal in 1925. He approaches very guardedly the question of free passage for American vessels and the prohibition of the use of the canal to vessels owned by railroads and expresses no pronounced conviction on these subjects.

The Titanic Disaster

Lord Mersey has rendered his decision in the case of the Titanic. The most important findings of the court were that the Titanic was sufficiently and efficiently officered and manned and complied with all the regulations of the British merchant shipping act regarding safety, but that the arrangements for manning and launching the life boats in an emergency were insufficient and that no drill had been held. The track of the steamer was held to be reasonably safe for the time of the year, provided great caution and vigilance were used in crossing the ice region. In view of the fact, however, that on the night of the accident the moon was not shining and especially in view of the high speed at which the Titanic was steaming, an extra lookout should, in the court's opinion, have been placed in the stem of the boat and a sharp watch kept by the officers on both sides of the bridge.

The judgment does not consider binoculars necessary. Searchlights, however, might be serviceable, but the evidence submitted to the court was insufficient to permit of a precise answer. The court recommends that the Board of Trade investigate the practicability of providing seagoing ships in addition to their watertight transverse bulkheads with a double skin carried above the waterline, or with a longitudinal vertical watertight bulkhead on each side of the vessel, or with both; that it should investigate regarding the question of providing of watertight deck or decks stretching along the whole or part of the length of the ship at a convenient distance above the waterline, and should also investigate whether the opening should be watertight doors or some other device; that it should also report generally on the increasing protection given by the subdivision of the vessel with the object of keeping the ship afloat with the greatest proportion of her length in free communication with the sea.

It is suggested that an international convention be called to agree on a common rule for the subdivision of ships, life saving apparatus, wireless regulations, speed in the ice regions and the use of searchlights.

The court held that Capt. Smith's course in maintaining speed in the face of ice warnings was in accordance with long existing custom due to competition and to the desire of the public for quick passages, adding:

"In the circumstances I am unable to blame Capt. Smith. He had not the experience which his own misfortune afforded to those whom he left behind. Other skilled men would have done the same in the same position."

Work in Coast Ship Yards

Coast Ship Yards Are Being Rapidly Filled With a Fine Program of Ship Building. Some of the Vessels Are for Foreign Account

Newport News Shipbuilding & Dry Dock Co., Newport News, Va.

Battleship Texas for the United States navy.

Fleet collier Proteus for the United States navy.

Fleet collier Nereus for the United States navy.

Freight and passenger steamer Lenape for the Clyde Steamship Co.

Lumber steamer Adeline Smith for the C. A. Smith Timber Co.

Car float for the Chesapeake & Ohio Railway Co.

Freight steamer P. H. Crowell, for Crowell & Thurlow Steamship Co.

Oil tanker for the Texas Steamship Co.

Freight steamer for New York & Porto Rico Steamship Co.

Ammunition lighter for United States navy.

Oil barge for the Southern Pacific Co.

Freight and passenger steamer for the Matson Navigation Co.

Oil tanker for East Coast Oil Co.

Bath Iron Works, Ltd., Bath, Me.

Torpedo boat destroyers Cassin and Cummings, for United States government.

Wm. Cramp & Sons Ship & Engine Building Co., Philadelphia, Pa.

Four passenger and freight steamships for W. R. Grace & Co., New York.

Six coal barges for the bureau of construction and repair, United States Navy.

Skinner Ship Building & Dry Dock Co., Baltimore, Md.

One steel oil barge, 153 ft. x 23.3 ft., for the Gulf Refining Co., New York.

One wooden derrick lighter, 80 x 23.9 x 7 ft.

Two wooden car floats, 224 ft. x 35 ft. x 8 ft., for Western Maryland Railroad Co.

Moore & Scott Iron Works Co., San Francisco, Cal.

Steel ferry boat for the Western Pacific Railway Co., San Francisco, Cal.

Staten Island Shipbuilding Co., Staten Island, N. Y.

Open deck lighter, for the New York Central Railway.

House lighter for New York Central Railway.

Tug boat, for Lehigh Valley Railroad.

Tug boat, for Texas Steamship Co.

Tug boat, for Hamburg American Line.

Torpedo float, for the United States navy.

New York Shipbuilding Co., Camden, N. J.

Battleship Arkansas, 98 per cent completed.

Battleship Moreno, 65 per cent completed.

Battleship Oklahoma, 3 per cent completed.

Torpedo boat destroyer Jarvis, 90 per cent completed.

Torpedo boat destroyer Downes, 10 per cent completed.

Naval tug Ontario, 90 per cent completed.

Naval tug Sonoma, 85 per cent completed.

Chinese cruiser Fei Hung, 50 per cent completed.

Oil tanker Rayo, for Standard Oil Co., 85 per cent completed.

Oil tanker El Segundo, for Standard Oil Co., 50 per cent completed.

Oil tanker Gulfoil. for the Gulf Refining Co., 60 per cent completed.

Harlan & Hollingsworth Corporation, Wilmington, Del.

Lumber and passenger steamer Columbia, for Wilson Bros. Co., for the Pacific coastwise trade; gross tonnage, 1,950; 1,200 I. H. P.

Freight steamer, John A. Hooper, for Sudden & Christenson, to be used in the Pacific coastwise trade; gross tonnage, 2,200; 1,700 I. H. P.

Lumber and passenger steamer California, for Olson & Mahoney, San Francisco, Cal.; gross tonnage, 1,800; 1,200 I. H. P.; to be used in Pacific coastwise trade.

Harbor lighter, Mauch Chunk, for the Central Railroad Co. of New Jersey, for use in New York harbor; gross tonnage, 491; 450 I. H. P.

Ocean tug Germantown, for the Reading Co., to be used in coastwise towing; gross tonnage, 647; 1,050 I. H. P.

Two passenger and freight steamers for the Central Vermont Trans. Co., for use on Long Island Sound; gross tonnage, 4,000; 4,800 I. H. P.

Fore River Shipbuilding Co., Quincy, Mass.

Four Holland submarine boats, Nos. K-1 and 2 and 5 and 6, for United States government.

Submarine tender Niagara, for United States government.

Torpedo boat destroyer Henley, for United States government.

Torpedo boat destroyer Duncan, for United States government.

Battleship Nevada, for United States government.

Argentine battleship Rivadavia.

Oil tank steamer Richmond, for Standard Oil Co.

Sulphur steamer, for the Union Sulphur Co.

Molasses steamer Nelson, for Cuba Distilling Co.

Seattle Construction & Dry Dock Co., Seattle, Wash.

Steel passenger steamer Potlatch, for Inland Navigation Co.

Steel passenger steamer Tacoma, for Inland Navigation Co.

Suction dredge, for United States government.

United Engineering Works, Alameda, Cal.

Oil tanker, for Standard Oil Co.

Towing steamer, for Northwestern Fisheries Co.

Lumber steamer, for S. S. Freeman Co.

Steel lumber steamer, for F. Linderman.

Wooden lumber steamer for the Hartwood Co.

Wooden lumber steamer, for J. Davenport.

Wooden lumber steamer, for the Hammond Lumber Co.

Wooden lumber steamer, for the E. L. Wood Lumber Co.

Wooden lumber steamer, for Charles H. Higgins.

Union Iron Works, San Francisco.

Two steam lumber schooners, for Loop Lumber Co.

Merrill-Stevens Co., Jacksonville, Fla.

Steel stern wheel steamer, 187 ft. long, for the Clyde Steamship Co.

Maryland Steel Co., Sparrows Point, Md.

Two colliers, Orion and Jason, for the United States navy department.

Eight steel steam freight vessels, for the American-Hawaiian Steamship Co., length over all, 429 ft.

Two bay passenger steamers, for the Baltimore, Chesapeake & Atlantic Railway Co.

Work in Lake Ship Yards

AMERICAN SHIP BUILDING CO., CLEVELAND, O.

To be built at	Type or Name	Dimensions in feet. Overall.	Keel.	Beam.	Depth.	Dimensions of engines.	Dimensions of boilers in ft. and in.	Draft, forced or natural.	Steam pressure, lbs.	Capacity, gross tons.	For whom building.
Cleveland...	Sand str.	166	156	37	10	17½ 38½ x 30	Scotch	Natural		... 750 yds.	Pelee Island Sand & Gravel Co.
Lorain.....	*Bulk frtr.	600	580	58	32	24 39 65 x 42	2 Scotch 16 x 11½	Ellis & Eaves	170	12,000	Pittsburgh Steamship Co., Cleveland, O.
Lorain.....	*Freighter	600	580	58	32	24 39 65 x 42	2 Scotch 16 x 11½	Ellis & Eaves	170	12,000	Pittsburgh Steamship Co., Cleveland, O.
Lorain.....	Oil barge	260	250	43	25					... 1,000,000 gal.	Standard Oil Co., New York.
Wyandotte..	Pass. str.	500	485	58	23.6	66 96 96 x 108	†See foot note	Howden	165	.....	Cleveland & Buffalo Transit Co., Cleveland, O.
Lorain.....	*Oil bge.	260	250	43	25					... .	Standard Oil Co., New York.
Pt. Arthur..	Pass. str.	385	362	52	28.9	29½ 47½ 58 58x42	4 Scotch 15.6 x 11	Howden	200	.....	Northern Nav. Co., Ltd., Collingwood, Ont.
Pt. Arthur..	*Pkg. frtr. Calgarian	257	244	42.6	26.6	18 29 48 x 40	(2) 11.6 x 11	Ellis & Eaves	180	3,000	Canadian Interlake Line, Ltd., Toronto, Ont.
Cleveland...	Steel dump scow	180	...	40	..						Starke Dredge Co., Milwaukee, Wis.
Lorain.....	Oil str.	260	250	43	25	19 31 54 x 42	14.6 x 11.6	Natural	200	800,000 gal.	Standard Oil Co., New York.
Lorain.....	Oil bge.	260	250	43	25					... 1,000,000 gal.	Standard Oil Co., New York.
Cleveland...	*Oil str.	260	250	43	23	19 31 54 x 42	14.6 x 11.6	Natural		... 800,000 gal.	Standard Oil Co., New York.
Cleveland...	*Oil str.	260	250	43	23	19 31 54 x 42	14.6 x 11.6	Natural		... 800,000 gal.	Standard Oil Co., New York.
Cleveland...	*Oil bge.	260	250	43	23					... 1,000,000 gal.	Standard Oil Co., New York.
Cleveland...	*Oil bge.	260	250	43	23					... 1,000,000 gal.	Standard Oil Co., New York.
Lorain.....	*Bulk frtr.	600	580	58	32	24 39 65 x 42	16 x 11.6	Ellis & Eaves	170	12,000	Pittsburgh Steamship Co., Cleveland, O.
Pt. Arthur..	Sternwheel str.	227.6	200	40	8	16⅜ 35⅜ x 96	7.6 x 28.2½	Natural	200	.....	Canadian Pacific Ry., Fort William, Ont.

†Six single-ended Scotch boilers, 14 x 10.6; three double-ended Scotch boilers, 14.2⅜ x 20.5½.
*Isherwood system.

GREAT LAKES ENGINEERING WORKS, DETROIT, MICH.

Ecorse.....	A. A. Raven	390	370	48	30	19 27¼ 40 58 x 42	14.2 x 12	Great Lakes Forced	210	5,000	American Transportation Co., New York.
Ecorse.....	Ruby	261	241	43.6	29	21½ 35½ 58 x 42	14.2 x 12	G. L. Forced	180	3,000	American Transportation Co., New York.
Ecorse.....	George Hawley	261	241	43.6	29	21½ 35½ 58 x 42	14.2 x 12	G. L. Forced	180	3,000	Boston & Virginia Trans. Co., Boston, Mass.
Ecorse.....	Edison Light	261	241	43.6	29	21½ 35½ 58 x 42	14.2 x 12	G. L. Forced	180	3,000	Boston & Virginia Trans. Co., Boston, Mass.
Ashtabula...	15 barges	261	241	43.6	27.6	21 34½ 57 x 42	13 x 12.1¼	G. L. Forced	175	3,000	Alabama & New Orleans Trans. Co., New York.
Ashtabula...	Pkg. frtr.	261	241	43.6	27.6	21 34½ 57 x 42	13 x 12.1¼	G. L. Forced	175	3,000	Western Transit Line, Buffalo.
Borgne Canal, La.	Robt. M. Thompson	240	...	32	8	Producer gas or oil engine			...	1,000	American Transportation Co., New York.

TOLEDO SHIP BUILDING CO., TOLEDO, O.

Toledo.....	Sea-going frghtr.	261	249	43.6	27	21 34½ 57 x 42	(2) 13 x 11.7	Forced.	175	.....	Boston & Virginia Trans. Co., Boston, Mass.
Toledo.....	Sea-going frghtr.	261	249	43.6	27	21 34½ 57 x 42	(2) 13 x 11.7	Forced.	175	.....	Boston & Virginia Trans. Co., Boston, Mass.
Toledo.....	*Miss River Sternwheel str.	160	....	32	5.6				...	.....	
Toledo.....	Car ferry	266	232	62	25	Engines of C.F. Ste. Marie to be installed	(6) 12 x 11		125	.....	Mackinac Transp. Co., St. Ignace, Mich.
	*Hull only.										

MANITOWOC SHIP BUILDING & DRY DOCK CO., MANITOWOC, WIS.

Manitowoc..	Tug hull 50	92	82	22	12	18 x 38 30	13 x 12.6	Natural	180	.....	Chicago River & Indiana Ry. Co., Chicago, Ill.
Manitowoc..	Scow hull 55	...	...	....	..				...	1,600 cu. yd.	Fitzsimons & Connell Co., Chicago, Ill.

JOHNSTON BROS., FERRYSBURG, MICH.

Ferrysburg.	Gold dredge Natoma No. 7.	135	...	46.6	9.6				...	600	Natomas Consolidated of Cal., San Francisco, Cal.

COLLINGWOOD SHIP BUILDING CO., COLLINGWOOD, ONT.

Collingwood	Bulk frtr. canal str.	258.9	244	42.6	20	16 26 44 x 36	(2) 11.6 x 10.6	Howden Forced	180	2,250	Keystone Transp. Co., Ltd., Montreal, Can.
Collingwood	Bulk frtr.	550	530	58	31	24 40 66 x 42	(3) 13 x 11	H'd'n Forced	185	10,000	St. Lawrence & Chicago Steam Nav. Co., Ltd., Toronto, Can.
Collingwood	Single screw bucket dge	218	210	37.6	14	15 25 42 x 26	(2) 11.6 x 10.6	H'd'n Forced	180	.....	Dept. Marine & Fisheries, Canadian govt.
Collingwood	Single screw bucket dge.	218	210	37.6	14	15 25 42 x 26	(2) 11.6 x 10.6	H'd'n Forced	180	.....	Dept. Marine & Fisheries, Canadian govt.

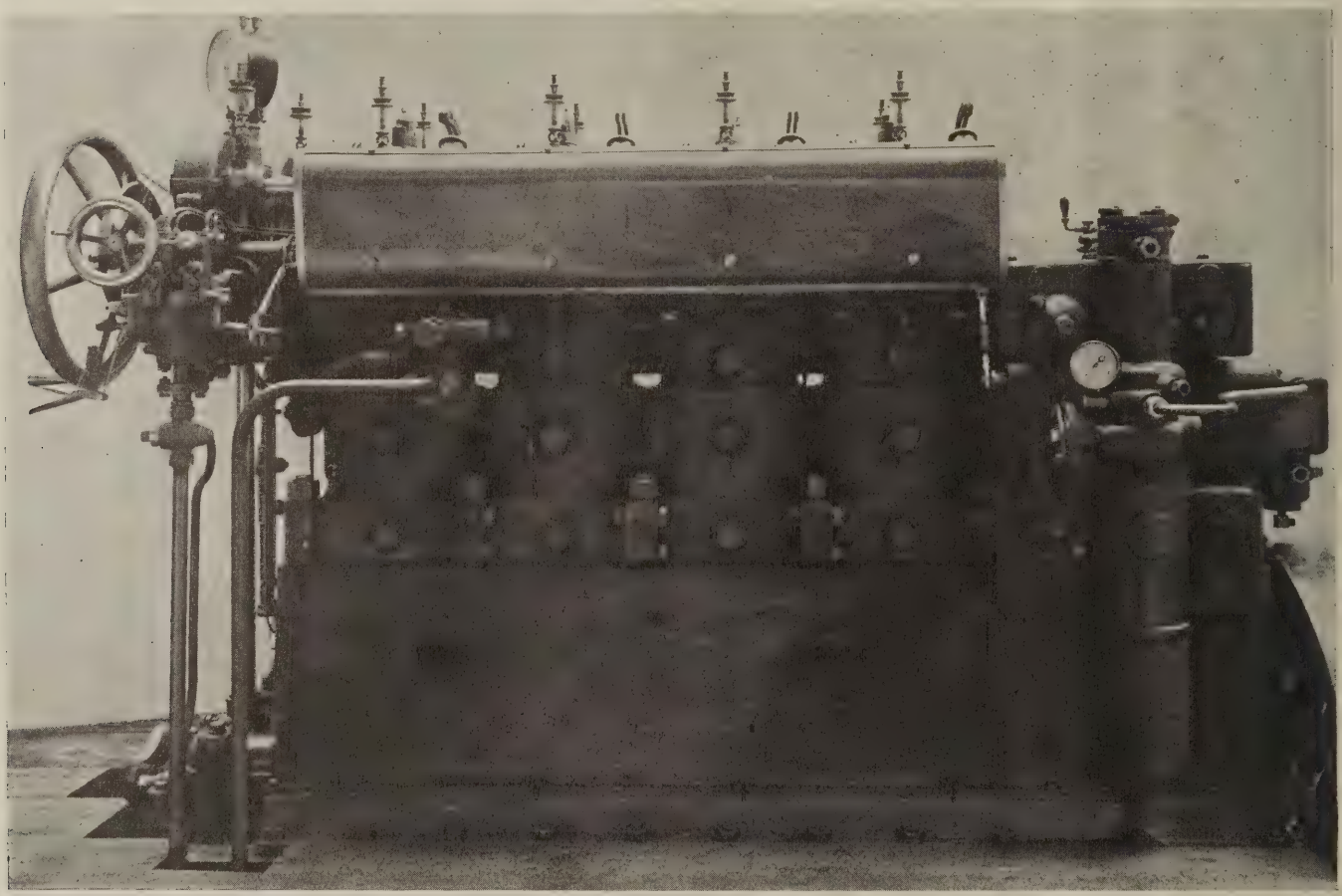
POLSON IRON WORKS, LTD., TORONTO, MICH.

Toronto....	Ferry str. Kwasind	70	...	15	6.2	7 14 x 10	Fitzgibbon, 51 x 84 x 84 Scotch		150	.....	Royal Canadian Yacht Club, Toronto, Can.
Toronto....	Tug	80	...	20	10	12 26 x 18	10 x 11		145	.....	Dept. of Public Works, Dominion govt.
Toronto....	Tug, steel	55	...	13	8-7½		7 x 9		150	.....	Dept. of Railways & Canals, Dominion govt.
Toronto....	Drill boat Fogabola	80	...	30	6		Water tube		150	.....	John E. Russell, Toronto.

Crude Oil Engines

The Italian Navy Has Adapted the Kind Design and Has Installed One in a Small Tank Boat—Description of the Type

There has recently been installed in a small tank boat for the Italian navy a heavy oil engine, built by Ing. Paolo Kind & Co., of Turin, that has many elements of economy and safety to commend it as a reliable prime mover for small craft. This firm is manufacturing a medium-speed, high-pressure heavy oil engine from 10 H. P. up with fuel consumption varying from 0.42 to 0.59 lb. per effective horse power hour, and the cost of operation varies from one-third to one-half cent per effective horse power hour. The economy over an American marine engine of 50 H. P. burning gasoline is apparent. A Kind engine of 50 H. P. would consume 25 lbs. of crude oil at a cost of about 21 or 22 cents as against six and one-half gallons of gasoline at a cost of from 65 to 75 cents. A photo and sectional plan of the Kind heavy oil engine is herewith published. The engine is of the two-cycle type, using high compression to ignite the charge and the other features of air scavenging, fuel pulverization which are well known attributes of nearly all European makes. The Italian admiralty has adopted the Kind engine exclusively. The diagram herewith shows its installation in the tank boat of a four-cylinder 70 H. P. engine. This engine must not be confused with those using a hot bulb or torch to induce a preliminary heating of some part of the combustion chamber before the engine can be started. This thermic Italian motor works quite differently.

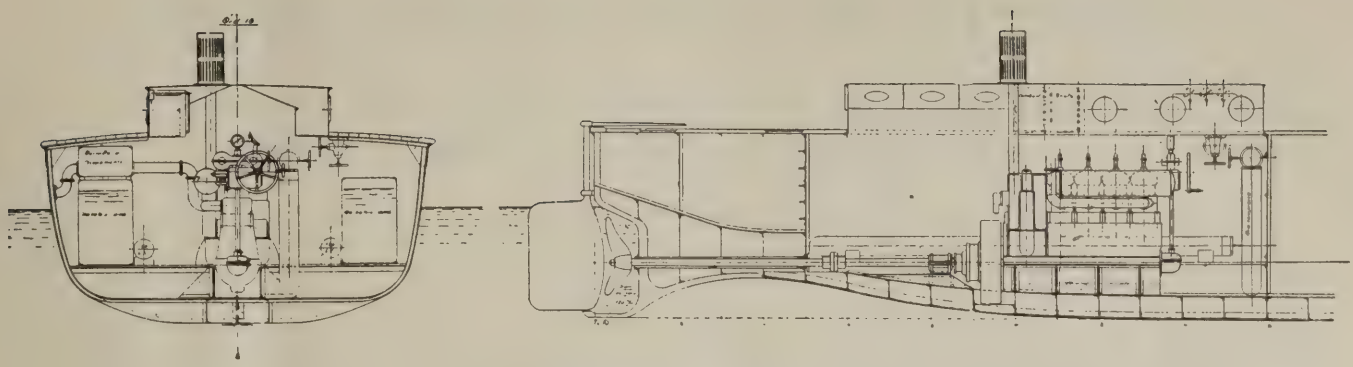


PHOTOGRAPH OF A 150 H. P. KIND CRUDE OIL ENGINE, BUILT IN ITALY AND ADOPTED BY THE ITALIAN NAVY. IT OPERATES ON THE TWO-CYCLE PRINCIPLE

The air compressed at about 30 to 35 atmosphere (440 to 525 lbs. per square inch), acquires a temperature sufficiently great to enflame (without the necessity of making preliminary red hot any part of the cylinder) the combustible previously pulverized by a compressed air jet, as soon as it is introduced into the cylinder. The introduction of the combustible is made gradually, starting from the dead point, so that instead of an explosion a combustion is produced, which does not sensibly increase the pressure acquired during the compression.

The process is, therefore, comparable to the introduction of the steam in a steam engine, and it is evident that the absence of the explosion is a valuable guarantee for the durability and safety of the engine. It may be stated that the high compression Diesel motors so far constructed are, in most cases, the old four-stroke cycle, where a firing takes place at every second revolution of the crank shaft. This Italian two-stroke motor, on the contrary, works after the two-stroke cycle, that is, a combustion for each cylinder for every revolution of the crank shaft, and so giving, it is said, a great advantage in favor of the running regularity and weight economy.

The operation, simply stated, is as follows: The piston (which acts as



INSTALLATION OF 70-H. P. KIND AIR CONTROLLED HEAVY OIL ENGINE IN A TANK BOAT FOR THE ITALIAN NAVY

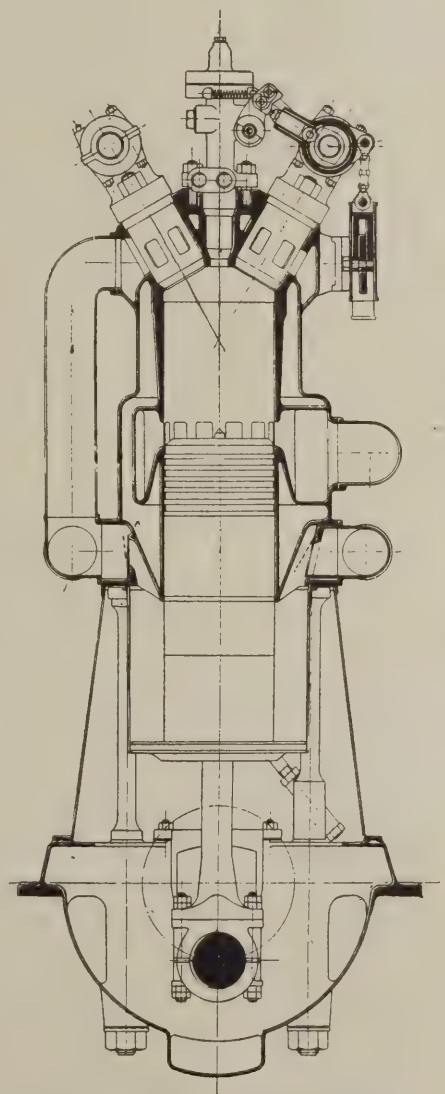
the cross head) sliding in the cylinder, closed in the upper part and open in the lower one, uncovers a series of exhausting slots placed in the cylinder at the lower dead point. In the cylinder cover are: A valve for starting, another for the admission of the air, and a third for the combustile. When the piston is at the lower dead point, the exhausting ports are open and the air inlet valves are also open. Through these last an air current passes into the cylinder, which blows off the remnants of the preceding combustion, and thus the cylinder is filled with pure air. After a time the inlet valves are closed and the piston in its upward stroke covers the exhausting ports and compresses the air at about 30 to 35 atmospheres (atmospheric pressure at 30 barometric reading and 62 degrees Fahr. is 14.7 pounds per square inch).

When the piston reaches the upper dead point and before starting the descending stroke, the fuel valve is opened and the pulverized combustile is admitted. By contact with the air, brought to an elevated temperature by the compression, the combustible is enflamed and keeps on entering and burning for a lapse of time determined by the power required; keeping the pressure nearly constant. During such lapse of time the piston will already have made a part of the descending stroke; then the fuel valve is closed and the expansion of the burned gases takes place up to the time when such gases helped by the air inlet escape through the exhaust ports which are now uncovered by the piston that has reached the lower dead point.

It may be stated that as soon as this is passed, the cycle already described is repeated. The starting valve serves to give the first impulse to the stopped motor, and works like a steam inlet valve. The compressed air for the injecion of the combustible is produced by a compressor with piston working steadily and, as soon as the motor is started, refurnishing also the air tank for the starting. The compressed air needed for the motor is contained in three tanks, two of which are for the starting, and one, for the injection of the combustible while the motor is running.

The air current for the cleaning and filling of the cylinders, is produced by a special pump keyed on the crank shaft.

The combustible is introduced into the cylinder by means of a special pump which administers in an exact way the quantity necessary for each impulse. A hand regulator, or a centrifugal regulator in the case of power plant, acts on the same pump, changing in a very sensible way the dosing of the combustible.



SECTIONAL VIEW OF THE KIND HEAVY OIL ENGINE

By means of a lever the valves are brought to the proper position to start the motor and after a few revolutions, by displacing the lever, the starting valves are put out of the way and the combustible inlet valves come into action and thus the motor takes its normal running.

It is claimed that these Italian motors can be reversed in two and one-fifth to three seconds, and it is pointed out that this special characteristic of the Kind reversible motor, does away with the possibility of dangerous mistakes due to unskillfulness. It is maintained that the starting is always instantaneous and even when left dle for months the motor can at once develop all its power. The running is completely automatic; and once started, the machine can be left to the care of the regulator. Refined petroleum as well as very dense oils can be used.

In the smallest, directly reversible, high-speed marine engines of 40 to 50 effective horsepower, with four cylinders, the number of revolutions is of 500 up to 650, while in the light, high-speed, 3,000-effective horsepower marine engines, the number of revolutions is reduced to 350 per minute. The weight of the high-speed and warship motor is reduced to 15 kilograms, or 33 lbs., per effective horsepower, while the weight of the normal, light type engine is from 44 to 66 lbs. per effective horsepower.

F. B. Slocum, of the Continental Iron Works, Brooklyn, N. Y., secretary of the Supplymen's Association of the American Boiler Manufacturers' Association, has published a list of the boiler manufacturers of the United States and Canada, which ought to be of considerable value to manufacturers of tools, material men, mechanical engineers and boiler builders. The price of the book is $5.00.

Lake-Built Salt Water Ships

During the Past Two Years Lake Ship Builders Have Turned Out Considerable Tonnage for Coast Account—Their Workmanship Commended on All Sides

An interesting development has taken place on the great lakes during the past two years or more, and that is the construction of vessels for salt water service. These contracts have been secured in the open market and have been let strictly on the basis of the lowest and best bid. The work has been most satisfactory in every way and in fact more orders would have been secured were it possible to get larger ships to salt water through the Canadian canals. Within the dimensions of the canals, however, lake shipyards have demonstrated that they have nothing to fear from coast or foreign ship yards. At prices at present ruling abroad the lake yards can build quite as cheaply as Britain. Both Lloyds Register of Shipping and the American Bureau of Shipping have spoken in the highest terms of the recent production of lake yards. When Mr. Buchanan, Lloyds chief surveyor, came over from London to inspect some lake ships he frankly expressed his surprise and delight at the character of the workmanship displayed, saying that the riveting of the hull practically amounted to boiler construction.

Went to the Coast for Work

The financial panic of 1907, put a quietus upon ship building for lake trade and lake ship builders in order to keep their plants going were compelled to seek work wherever they could find it. It was necessity which drove them to the coast, and now having found a field there, they are not likely to abandon it. During the past two years lake ship yards have built over twenty vessels for coast account and that their work is clean and prices fair is proved by the fact that duplicate orders are coming in. It is probably not too much to say that hereafter lake shipyards will never be without a vessel or two on their stocks for the coast, especially so as the opening of the Panama canal will develop many collateral trades in which ships of the sizes that can readily pass through the Canadian canals will find employment.

As an evidence of this, the Great Lakes Engineering Works, of Detroit, has closed contract for the construction of fifteen self-propelling barges that are intended to be used in conjunction with the transportation of coal from the Black Warrior Basin in Alabama along rivers tributary to the Mississippi, the intention being to deliver the coal at New Orleans for general purposes, including the bunkering of ships. In fact, the bunkering of ships will unquestionably be a growing trade in the south, as vessels will undoubtedly require coal before resuming either their Pacific or Atlantic voyages after passing through the canal. Coal at Suez costs $6 a ton. It could be profitably sold at Panama for considerably less than this. Granting that it would only be $1 per ton less, the saving in the coal bill of a ship of about 3,000 tons in a round trip from New York to the Philippines would be about $2,600, a most important item.

The building of oil tankers is one of the most interesting features of ship construction at present. Ship yards all over the world are building this type of craft, there being probably fifty at present under construction in British yards. The American Ship Building Co. has during the past two years received orders from the Standard Oil Co. for sixteen oil tankers, all of them with one exception being for salt water service. Daniel E. Ford, of the Standard Oil Co., says of the Renown, recently completed by the American Ship Building Co., that she is the finest specimen of oil tanker that he has ever inspected.

Indorsed by Lloyds

James French, who has represented Lloyds Register of Shipping on the Great lakes for the past two years, has given unqualified endorsement to the work of the lake shipyards, saying that it is first class in every particular and equal to anything turned out on the Clyde. No man is more qualified to speak on this subject than Mr. French, because his experience has been large and he has made a most intimate study of lake construction since he came to this country. During his recent visit to Great Britain he found underwriters very much interested in this subject and perfectly willing to take lake risks.

Lake shipyards in their campaign for coast work have had to overcome prejudice. The earlier vessels sent to the coast, say some fifteen years ago, did not make a favorable impression. It is not surprising that they did not, as they were designed exclusively for lake trade with no thought whatever of ever reaching salt water. It was only the vicissitudes of trade that sent them there at all. Obviously they were not adapted to salt water conditions, lake shipbuilders earning a reputation which they by no means deserved. The vessels that have gone to the coast during the past two years from lake yards have reversed this opinion altogether. These vessels have created a very favorable impression and coast owners are beginning to pay some attention to the lakes.

Inquiries from the Coast

In this connection it is interesting to note that Charles Skentelbery, marine superintendent of the New England Coal & Coke Co., Boston, Mass., has just made a tour of lake yards, visiting Cleveland, Lorain, Toledo, Ashtabula, and Detroit. He said that the work which he had observed in all of the yards was extremely clean and creditable, not excelled anywhere. He was entirely spontaneous and unreserved in relating his impressions. The New England Coal & Coke Co. does an extensive business on the Atlantic seaboard. Until a few years ago coal was almost exclusively transported on the seaboard in schooners or in barges towed by tugs. Three or four years ago the New England Coal & Coke Co. built four colliers, the Everett, Malden, Melrose and Newton, which have given eminent satisfaction, and the company will undoubtedly gradually replace its wooden sailing tonnage with new steel steam tonnage. These colliers are considerably in excess of Canadian canal dimensions, being 406 ft. long and 52 ft. beam, and Mr. Skentelbery was non-committal on the subject as to whether the company contemplated the construction of a smaller-sized ship. There is no question whatever that if the Canadian canals were larger, lake shipbuilders would get more orders from the coast than they are getting.

The Great Lakes Engineering Works, which is now building five vessels for coast account, could have procured six additional contracts had it been possible to get the vessels through the canals. Reference to a table published elsewhere will show the amount of work that the lake shipyards are doing for coast account.

The American Ship Building Co. is building eight, the Great Lakes Engineering Works five, and the Toledo Ship Building Co., two. Lake shipyards, while not having a great deal of new construction on hand for lake account, are nevertheless busy, the Great Lakes Engineering Works reporting that they are short of help and could employ 250 more men than they have been able to obtain.

The Bulk Freighter and Lake Trade

Herewith are appended a couple of tables upon which anyone associated with lake trade may put his own construction. One gives the movement of bulk freight (iron ore, coal and grain) on the great lakes during the past seven years; the other gives the number and capacity of the bulk freighters available to carry this freight. The table has been carried back only to the beginning of the year 1905, or since the advent of the so-called big ship into the bulk freight trade of the great lakes.

In compiling the table of bulk freighters, the lumber carriers and package freighters have been eliminated. There are between 250 and 300 lumber carriers on the lakes, but none of them carry ore. They occasionally carry coal, but they are being gradually eliminated from this trade as completely as they are from the ore trade. The package freighters of course never carry coal or ore, but they do carry grain. Mention is made of these circumstances in order that each one may figure for himself what inroads into the available bulk freight these collateral carriers make.

Table I shows the additions and subtractions that have been made during the past seven years in the bulk freight carrying fleet. The launchings given are those of bulk freighters only; the list of subtractions are also bulk carriers only, and are made up of actual losses through the elements, removals to the coast, or transfers to other trades. The figures show that during the past seven years 175 bulk freighters have been added to the available fleet and 101 removed.

TABLE I.

Year.	Launchings.	Subtractions.
1905	29	33
1906	40	18
1907	40	16
1908	24	4
1909	17	5
1910	20	17
1911	5	8
Total	175	101

An impartial analysis of the figures leaves a rather favorable impression and does not make out a bad case for the ship. It looks as though the trade would speedily absorb the tonnage now available to carry it. During 1905, 57,578,550 net tons of freight were moved and there were available to move it, 518 bulk freighters of 1,919,285 gross tons carrying capacity. Thirty cargoes are probably a high average for a season and if all these bulk freighters had carried 30 cargoes, they would have moved 57,578,550 gross tons during that year. Of course, the bulk freighters did not move all of this bulk freight, because the package freighters and lumber carriers undoubtedly made some inroads into the coal and grain trades; nor did all of the bulk freighters make thirty trips. Strandings, stress of weather and unforeseen circumstances must have delayed a portion of them. During 1910, 81,427,406 net tons of freight were moved and there were available on Jan. 1, 1910, 589 bulk freighters of 2,973,447 gross tons available to move it. These vessels could have moved in 30 cargoes 89,203,410 gross tons. This of course is considerable excess of tonnage capacity over freight offering, but then the lake freight trade has been known to increase 10,000,000 tons in a single year.

BULK FREIGHT MOVEMENT OF THE GREAT LAKES.

TABLE II.

Year.	Iron ore. Gross tons.	Coal. Net tons.	Grain of various kinds. Net tons.	Total. Net tons.
1905	33,475,904	14,401,199	7,515,875	59,410,086
1906	37,513,589	17,273,718	8,407,959	67,696,897
1907	41,290,709	21,486,927	8,617,375	76,349,896
1908	25,427,094	19,288,098	7,409,140	55,175.585
1909	41,683,599	18,617,396	8,255.444	73,558,471
1910	42,618,758	26,478,068	7,216,329	81,427,406
1911	32,130,411	25,700,104	8,742,228	70,428,392

TABLE III.

CARRYING CAPACITY OF LAKE BULK FREIGHTERS.

Year.	No. of vessels. Jan. 1.	Carrying capacity—Tonnage of same. Gross tons.	Carrying capacity—New tonnage constructed. Gross tons.	Carrying capacity—Tonnage subtracted. Gross tons.
1905	518	1.919,285	260,200	114,374
1906	514	2,065,111	381,000	40,987
1907	542	2,442,754	368,000	46,973
1908	567	2,766,781	101,400	14,837
1909	587	2,853,344	157,300	37.197
1910	589	2,973,447	194,500	60,617
1911	592	3,108,330	55,000	29,477
1912	589	3,135,953	.....	.....

To Build Fifteen Steel Barges

The Great Lakes Engineering Works, of Detroit, has received an order from the Alabama & New Orleans Transportation Co. for the construction of fifteen self-propelling steel barges to ply between the Black Warrior coal basin in Alabama and New Orleans through Black Warrior, Tombigbee and Mobile rivers, Mississippi Sound and Lake Borgne canal.

The barges will be built on Lake Borgne canal where a construction shop of the typical shipyard type will be erected about 10 miles north of New Orleans. The shop will be built parallel to the lake bank and the barges will be launched sideways. In addition to the fabricating of ships, the equipment of the yard will comprise a marine railway. The barges are to be 240 ft. long, 32 ft. wide and 8 ft. deep, having a carrying capacity of 1,000 tons on 6 ft. draught. They will be driven either by producer gas or oil engines. Experiments are now under way for the utilization of coke breeze in the production of producer gas. If the experiments result favorably the barges will be operated by producer gas, as there is an unfailing supply of coke breeze, practically a waste product, to be obtained in the Birmingham district. While there is no material difference in the cost of installing either producer gas or oil engines, it is estimated that the cost of operating producer gas engines will be only one-sixteenth of that of operating oil engines, owing to the cheapness and abundance of the fuel.

The enterprise is a totally new one and is merely another evidence of what one may expect of southern development when the Panama canal is completed. During the past 20 years the federal government has spent nearly $8,000,000 to make the rivers in which these barges will ply navigable. To finance its plan the Alabama - New Orleans Transportation Co., a New Jersey corporation, will issue $2,000,000 of 20-year 5 per cent gold bonds, of which the Union Trust Co. of Detroit, is the trustee. The barges will traverse a waterway of about 515 miles in length. At Grant's Pass there is a toll charge of $4 per barge on each passage, while at the Lake Borgne canal, which is owned by the company, a toll of 10 cents a gross ton will be levied. The mines in the Black Warrior basin last year produced 5,472,000 tons of coal. This coal is now being hauled by rail to New Orleans at a cost, including switching and terminal charges, of

$1.30 per ton. It is expected to make the water rate $1.20 a ton, which would show a profit of 37 cents a ton, exclusive of the toll of 10 cents which will be collected at Lake Borgne canal. It is the expectation also to build up a return freight in scrap iron and Cuban ores, as well as to engage in the business of bunkering ships at New Orleans, which will, of course, involve the construction of a fueling barge.

Officers of the company are: President, Phineas W. Sprague, Boston, one of the largest coal shippers of New England; treasurer, Vincent Goldthwaite, Boston, a director in the Massachusetts Gas & Electric Co.; vice president and general manager, John H. Bernhard, engineer from Amsterdam, Holland, who originated the project. Directors of the company include also H. H. Melville, New York, director in the Lake Superior Iron & Chemical Co.; Cecil A. Grenfell, London, Eng.; H. S. Fleming, New York, associated with the Berwind, White Coal Co.; Charles R. Dunn, Detroit, vice president and treasurer of the Union Trust Co.; George R. Carr, Chicago, vice president of the Dearborn Drug & Chemical Co., Breck Musgrove, Birmingham, Ala., coal dealer; A. S. Lyons, Mobile, Ala., director of the City Bank & Trust Co.

Steamer for Canadian Pacific

The Western Dry Dock & Ship Building Co., which is the Canadian yard of the American Ship Building Co., is building a very interesting little stern paddle-wheel steamer for the Canadian Pacific Railway for service on Kootenay lake, near Nelson, B. C. The steamer is 227 ft. 6 in. over all, 200 ft. keel, 40 ft. beam and 8 ft. deep, and is designed to draw 4 ft. 6 in. of water. Her engines are twin tandem compound, 16⅜ and 35⅜ x 96 in. stroke, driving a stern paddle wheel 24 ft. 6 in diameter. The engines are 75 ft. long from end to end, mounted on steel girders. A novel feature is that the connecting rod is built of channel and T iron 35 ft. centers. The engine was made as light as possible, as weights naturally have to be kept at a minimum. The main steam piping is of steel tubing ⅛-inch thick for 200 lbs. pressure. The main wheel shaft is 13 in. diameter of hollow forged nickel steel. The engine was built at Cleveland and shipped to Port Arthur where it was erected and shipped in an erect condition on two cars to Nelson. The hull itself will be shipped to Nelson in a knocked-down condition and it is estimated that it will require twenty-eight cars to transport it. D. Stevens, marine superintendent of the Canadian Pacific Railway, is superintending the construction of the steamer.

Dispatch in Ore Unloading

A record for dispatch in ore unloading was made by the steamer Wm. P. Palmer, at Conneaut, on July 26, when 11,044 gross tons of Group 3 ore was unloaded in 3 hours 15 minutes. The unloading began at 7:53 a. m. and was finished at 11:08 a. m. The machines employed were four 10-ton steam Hulett machines, one 15-ton electric Hulett machine and four 5-ton Brown electric machines. The detail per machine was as follows:

Hulett steam machine: No. 1, 3 hrs. 6 min., No. 2, 3 hrs. 10 min., No. 3, 3 hrs. 15 min., No. 4, 3 hrs. 4 min.; total four machines, 12 hrs. 35 min.

Brown electric machines: No. 1, 3 hrs. 14 min., No. 2, 3 hrs. 12 min., No. 3, 3 hrs. 15 min., No. 4, 3 hrs. 11 min.; total four machines, 12 hrs. 52 min.

Hulett electric machine: No. 1, 2 hrs. 56 min.

Total nine machines: 28 hrs. 23 min.; tons per hour, gross time, nine machines, 3,398.

In unloading the steamer J. P. Morgan in 3 hours 12 minutes at Conneaut on July 10, a record for dispatch was achieved without intention. No special preparations were made for unloading the boat in quick time, but it so happened that the conditions on the dock permitted all the machines to begin unloading simultaneously. This condition does not always arise because as a rule the machines are divided among different boats. The unloading commenced at 1:11 P. M. and finished at 4:23 P. M., the elapsed time being 3 hours and 12 minutes. The tonnage was 10,291 gross tons of Group 4 ore. The tons per hour for nine machines, start to finish, was 3,347.5. This grade of ore, Group 4, is bulky and is not favorable for rapid unloading as it sticks to the bucket. It is reasonable to assume that if the boat had contained an ore that handled freely that 20 minutes would have been clipped off the unloading time.

Steamer Bellechasse

The steamer Bellechasse, designed as a survey and inspection steamer for the St. Lawrence ship canal service, was recently launched from the yard of the Kingston Dry Dock Co., Kingston, Ont. The steamer is 140 ft. long over all, 130 ft. long, 27 ft. beam and 13½ ft. deep. The hull is of steel divided into five watertight compartments and has been specially strengthened to operate in light ice. The propelling machinery consists of two sets of triple-expansion engines with cylinders 12½, 21 and 34 in. diameter by 21 in. stroke, supplied with steam from two cylindrical boilers, allowed 180 lbs. pressure. The bunkers are placed longitudinally on each side of the boiler room and have a capacity of about 100 tons.

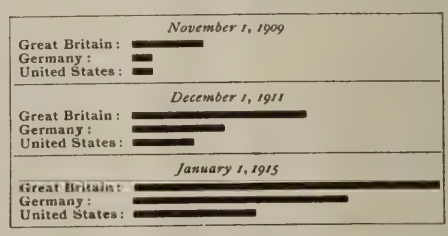
Trials of Battleship Arkansas

During the trials of the battleship Arkansas she struck a reef off Rockland, Me., while proceeding at about 13 knots. She struck under the port bow, just under the turn of the bilge and close to the keel, scraping along the reef for a distance of 44 ft., denting her ¾-in. plates and shearing off a number of rivets. After anchoring and examining the damage, it was decided to proceed with the trials as the injury was not serious. Her contract speed is 20.5 knots. On her highest run she made 21.493 knots. The table herewith gives the results of her various trials.

Trial.	Speed.	R.P.M.	S.H.P.
24-hr. 12-kt.	11.993	175.70	4,354
24-hr. 19-kt.	19.410	291.32	20,592
4-hr. full speed.....	21.051	323.83	28,534
2-hr. burning coal and oil	20.989	322.13	28,043
Average five highest standardization runs	21.20	328.00	28,751

Comparative Naval Strength

Herewith is published a diagram showing the naval strength of Great Britain, Germany and the United States in capital ships. On Jan. 1, 1912, Germany had nine capital ships



and the United States six, but on Jan. 1, 1915, according to the program laid down, the United States will have only 12 and Germany 21. The diagram includes the cruisers Michigan and South Carolina.

The Manitowoc Ship Building & Dry Dock Co. has received contract to build a tug for the Milwaukee Tug Line.

July Ore Shipments

July gave evidence of what the lake fleet is capable of doing. Notwithstanding shortage of cars, vicissitudes of weather and numerous unforeseen troubles, the fleet broke the June record easily. The movement reached 7,600,283 tons as against 7,567,555 tons for June, and it was practically all handled in contract vessels. Wild carriers got very little of it, shippers having about all they could do to keep contract vessels busy. The movement to Aug. 1, totals 21,290,904 tons, as against 14,064,291 tons, for August, 1911. The movement is rapidly overtaking 1910, when 21,863,549 tons were moved up to Aug. 1. Following is the summary by ports:

Port.	July, 1911.	July, 1912.
Escanaba	644,098	836,346
Marquette	309,438	513,924
Ashland	439,843	771,057
Superior	1,747,364	2,324,324
Duluth	1,108,316	1,540,324
Two Harbors	972,314	1,616,258
Total	5,221,373	7,600,233
1912 increase		2,378,860

Port.	To Aug. 1, 1911.	To Aug. 1, 1912.
Escanaba	1,711,806	2,478,294
Marquette	843,177	1,430,814
Ashland	1,102,263	2,103,858
Superior	4,698,855	6,668,655
Duluth	7,158,450	4,385,802
Two Harbors	2,549,740	4,223,481
Total	14,064,291	21,290,904
1912 increase		7,226,613

Lake Erie Ore Receipts

Out of total ore shipments of 7,600,233 tons during July 6,086,254 tons went to Lake Erie ports, distributed as follows:

Port.	July, 1912. Gross tons.
Buffalo	706,215
Erie	50,841
Conneaut	1,341,758
Ashtabula	1,368,024
Fairport	349,500
Cleveland	1,415,528
Lorain	583,735
Huron	74,097
Sandusky	.....
Toledo	162,688
Detroit	33,868
Total	6,086,254

Foreign Interests Ordering Ships

W. R. Grace & Co., of London, have placed an order with Cramps, Philadelphia, for four steamers for service between the Atlantic and Pacific ports, the first that a foreign interest has as yet placed with American yards. Grace & Co. are large operators, and do an extensive business, especially on the Pacific coast of North and South America, and the placing of the order in this country is doubtless for the purpose of obtaining American register for the vessels in order that they may engage in the coastwise trade of the United States and receive whatever contributory benefits there may be in the proposed Panama canal legislation. The new steamers are to be 405 ft. long, and of about 10,000 tons carrying capacity.

Commerce of Lake Superior

During July 10,781,304 net tons of freight passed through the canals at Sault Ste. Marie, an increase of 34,145 over the June movement. The movement to Aug. 1, was 30,632,074 tons, as against 22,939,511 tons, for the corresponding period of 1911, an increase of 7,692,563 tons. Following is the summary:

EAST BOUND.

	To Aug. 1, 1911.	To Aug. 1, 1912.
Copper, net tons	55,860	46,938
Grain, bushels	13,983,839	22,126,172
Building stone, net tons.	3,142	2,282
Flour, barrels	2,485,779	2,973,074
Iron ore, net tons	13,403,160	20,245,785
Pig iron, net tons	15,169	5,714
Lumber M ft., B M	247,370	284,262
Wheat, bushels	28,621,113	55,355,445
Unclassified freight, net tons	49,873	99,792
Passengers, number	18,528	14,955

WEST BOUND.

Coal, anth., net tons	938,432	505,225
Coal, bitu., net tons	5,899,591	5,981,229
Flour, barrels	125	.....
Grain, bushels	1,100	.....
Mfd. iron, net tons	181,446	290,934
Iron ore, net tons	9,486	3,188
Salt, barrels	303,043	362,286
Unclassified freight, net tons	565,727	531,467
Passenbers, number	21,935	17,063

SUMMARY OF TOTAL MOVEMENT.

East bound, tons	15,299,750	23,266,029
West bound, tons	7,639,761	7,366,045
Total	22,939,511	30,632,074
Vessel passages	8,088	10,020
Registered tonnage, net	18,010,793	24,631,067

Longitudinal Ship Construction

Editor MARINE REVIEW:—We recieved a copy of THE MARINE REVIEW, Vol. 42, No. 7, of July, 1912, in which is an article marked "Isherwood Patent Granted". In this article you gave the name of a number of ship yards who have under way or under order, vessels for construction under this system, and give our name, viz., James Rees & Sons Co., Pittsburgh, Pa., 3. The firm of James Rees & Sons Co. are building these vessels on a line on which they did have a patent and which patent has expired, wherein the bottom of skin of the boat was secured to the frame of the vessel; the longitudinal ship construction is not new to the ship yards on our western rivers, and we will continue on the line we have always constructed, without regard to any patent which may have been issued recently, simply because there is nothing new in the construction of our boats but what we have used during the last 30 or 40 years. Therefore, I wish you to make a broad denial that we are using the invention or new design of any man in the construction of our boats, which you stated in the above mentioned article we were, and we surely will not ask any license to continue in the same line and method.

Yours truly,
JAMES REES & SONS CO.,
T. M. Rees, General Manager.
Pittsburgh, Pa., July 22, 1912.

An error was made in crediting the construction of these three barges to James Rees & Sons. They are being built by the American Bridge Co., at Ambridge, Pa., for the Texas Steamship Co., 17 Battery place, New York, under the supervision of George B. Drake, naval architect. John H. Dialogue & Son, Camden, N. J., are also building three. The six barges are all on the Isherwood system, and are 135 ft. over all, 35 ft. molded beam, and 9 ft. molded depth.

Obituary

Capt. John H. Bartow, president of the Lake Erie Ore Co., died at his home, 2066 East Eighty-ninth street, Cleveland, on July 10, at the age of 68 years. He had been identified with lake trade practically all his life. He settled in Cleveland about 30 years ago, and engaged in the vessel brokerage business with B. L. Pennington, and later was associated with Capt. J. W. Moore, forming eventually the firm of Moore, Bartow & Gilchrist. For the past ten years he had been engaged in the ore business and was the head of the Lake Erie Ore Co., operating mines in the Lake Superior district.

Capt. James J. Rardon died at his home in Chicago on July 31. He was one of the best known vessel owners and brokers on the lakes, having been identified with the trade since boyhood. He began his career on sailing vessels, later coming ashore to establish a vessel brokerage and insurance business at Chicago, first associating himself with C. A. McDonald and later with C. W. Elphicke & Co.

Personal

Walter B. Pollock, manager marine department, New York Central Lines, has left for a trip to the Pacific coast.

James French, principal surveyor of the chief ship surveyor's staff for Lloyds Register, will make his headquarters in New York hereafter. His place in Cleveland will be taken by O. Norbeth as hull surveyor, J. S. Heck remaining as engine surveyor.

Accidents to Lake Vessels

Since the opening of navigation many accidents, some of them of a serious nature, have occurred. even of them are either total losses or total constructive losses. The tug Charles A. Trinter was totally destroyed by fire at Vermillion on April 25. The Canadian steamer Iona, coal laden, took fire on Lake Ontario on May 20 and burned to the water's edge, the crew escaping in lifeboats. The little steamer Joseph C. Suit was accidentally hit by the City of Detroit III approaching the dock and was sunk. The Canadian steamer Bothnia was sunk in St. Clair river in collision with the steamer S. S. Curry, on June 26, being practically cut in two when the Curry sheered into her through a disabled rudder. The steamer Sidney C. McLouth was destroyed by fire on Green Bay on June 28. The steamer Viking ran ashore at Split Rock, Lake Superior, and will probably be abandoned to the underwriters as a constructive total loss. The steamer Columbia, of Niagara Falls, was badly damaged by fire at Ogdensburg on July 5 and may be a total loss.

Losses of life have also occurred. Five men lost their lives in an explosion on Standard Oil Barge No. 88 while lying near the Great Lakes Towing Co.'s yard in the Cuyahoga river. Two lives were lost by the bursting of steam pipes in the engine room of the steamer James Davidson on Lake Superior.

The steamer James H. Hoyt met with a serious accident by grounding near Garden Island, damaging 81 frames and 13 plates. Captain Thomas Garrity was dismissed from the service of the Pittsburgh Steamship Co. on account of this accident.

The steamers P. P. Miller and Victory were in collision in St. Clair river, the Miller endeavoring to pass the Victory, both upbound, while a downbound steamer was approaching. The collision might have been serious, but was avoided by skillful maneuvering.

An analysis of the more important accidents will develop the fact that practically all of them could have been avoided by careful observance of the rules of navigation. The summary is as follows:

Some of the losses will entail considerable repairs, notably the steamer G. J. Grammer, which was sunk in collision with the steamer Northern Queen near Corsica Shoal, Lake Huron, on July 14. She was raised and taken to Port Huron where temporary repairs were made. Later she went into dry dock at Cleveland where three weeks were spent in making repairs. The accident is supposed to have been caused by the steering engine of the Northern Queen choking.

In coming down on the Canadian side of the river on July 14, the steamer W. K. Bixby hit the lightship Kewaunee which had been anchored over the wreck of the sunken steamer Joliet. The Bixby dragged her length over the Joliet and did considerable damage to her bottom. Repairs on her will amount to about $30,000 as about 70 plates were damaged.

The steamer G. Watson French collided with the steamer Mataafa off Grosse Point, Lake St. Clair, on July 27, damaging the Mataafa very badly. A survey at Toledo shows that her port side is broken in and bent for a distance of 100 ft. with severe buckling of the deck. She will be about three weeks in dry dock.

The accidents have been sufficiently numerous to keep the ship yards busy for several weeks.

Date.	Name of Vessel.	Nature of Accident.	Place.
Jan. 8	Tug Townsend Davis.....	Cut through by ice and sank; floated Jan. 23.....	Erie, Pa.
Jan. 8	Str. Ball Brothers.....	Damaged by fire; cabins badly burned; damage estimated at $6,000	Duluth, Minn.
Mar.	C. F. Pere Marquette 20.....	Damaged her wheel in ice; repaired at Milwaukee.....	
Mar. 13	C. F. Pere Marquette 19.....	Ran aground; one plate under engine room punctured.....	Near Manitowoc, Lake Michigan
Mar. 16	C. F. Pere Marquette 16.....	Damaged by fire; temporarily repaired at Milwaukee.....	
Mar. 19	Str. Conestoga	Stranded; docked at Milwaukee for new wheel.....	Donges Bay, Milwaukee.
———	Str. Flora M. Hill.....	Crushed in ice and sank; to be raised.....	Near Chicago, Lake Michigan.
———	C. F. Marquette & Bessemer No. 2	Broke her wheel in heavy ice; released herself; docked for repairs to her stern bearing on June 7.....	Near Conneaut, Lake Erie.
Apr. 12	Str. Sahara	Lines parted and she hit Str. Schoonmaker, damaging one plate..	Ashtabula.
Apr. 20	Str. J. J. Barlum.....	Engine trouble encountered shortly after she left port; put back to breakwater	Near Milwaukee, Lake Michigan
Apr. 24	Str. Powell Stackhouse	Stranded; No. 1 tank leaked and forepeak filled with water; released after lightering; unloaded at Milwaukee and then left for South Chicago where she was docked; left dry dock May 22...	Lansing Shoal, Lake Michigan.
Apr. 24	Str. Selwyn Eddy.....	Hit Chicago Ave. bridge while coming out of harbor; leaked.....	Chicago harbor.
Apr. 25	Tug Chas. A. Trinter.....	Burned; loss, $3,000	Port Clinton, O.
———	C. F. Marquette & Bessemer No. 1	Damaged two bow plates in ice.....	
———	Str. Chas. A. Weston.....	Hit by Str. Congdon which broke away from tugs and had two plates damaged	Milwaukee, Wis.
Apr. 30	Str. Simon Langell.....	Stranded; released by tug Harding.....	Grassy Island, Detroit river.
May 1	S. O. Bge. No. 88.....	Damaged by fire caused through explosions; five lives lost; barge not seriously damaged, but will have to have new booms, spars and sails	Cleveland, O.
May 2	Str. Empress of Midland.....	Ran ashore in fog; released on eighth by tugs and went to Collingwood. Ont., for repairs	Cabot's Head, near Tobermoray, Ont.
———	Str. James H. Hoyt.....	Struck and was docked at Superior upon arrival there May 6; leaked; left dry dock May 28.....	Straits of Mackinac.
———	Str. Turret Court	Ran aground; had to lighter	Fort William Harbor.
May 4	Gravel barge	Hit by Str. Wyandotte while turning; hole stove in barge, sinking her instantly	Menominee river.
May 4	Str. Agassiz	Ran aground	Portage Lake.
May 5	Str. Frank Rockefeller.....	Collided with Str. E. D. Carter in thick weather; bow stove in to forward bulkhead; repaired at Superior; repairs completed May 18	Superior, Wis.
May 5	Str. E. D. Carter.....	Collided with Str. Frank Rockefeller in thick weather; three or four plates in bow damaged and anchor broken.....	Superior, Wis.
May 5	Str. James E. Davidson.....	Ran ashore in thick weather; released on May 7 after lightering 75,000 bu. of grain; reloaded lightered cargo and proceeded on her trip. Docked at Toledo for repairs.....	Pelee Island, Lake Erie.
May 5	Str. Cherokee	Ran aground at lower end of Island; released May 7 by dredging	Fighting Island.
———	Str. Francis L. Robbins.....	Struck in heavy weather; leaked badly; all damage on starboard side; docked at Superior; 17 plates had to be removed, 10 of which were replaced with new ones; 35 damaged frames; ten or twelve to make repairs.....	Manitou Island.
———	Str. P. P. Miller.....	Struck in heavy weather; only slightly damaged.....	Manitou Island.
May 6	Str. America	Ran aground; tug and lighter sent to her; released on May 8; leaked; repaired at Manitowoc.....	White Shoal, Lake Michigan.
———	Str. Bethlehem	Struck on her way up lakes; docked at Chicago; bent rudder,	

May 7	Str.	Smith Thompson	broken quadrant and possibly bottom damage	Sault river.
———	Str.	Shenango	Stranded, owing to derangement of steering gear; released on May 9 after lightering	Detour, St. Mary's river.
			Struck, going up; docked at Ashtabula; six damaged plates and 12 broken frames	Long Point, Lake Erie.
May 12	Str.	Sultana	Ran ashore in heavy sea; tugs sent to her; released on May 14..	
———	Str.	Fred G. Hartwell	Arrived at Port Huron on May 14 with disabled steering gear; towed to Detroit for repairs	
———	Str.	Roman	Ran ashore; tug sent to her; large part of cargo lightered and released on May 17	Whaleback Shoal, Green Bay.
May 15	Str.	Victory	Ran into dock and broke her quadrant; delayed several days....	Lorain harbor.
———	Str.	E. J. Earling	Severely pounded in storm; rivets loosened; docked at Lorain May 20; one week to make repairs	
May 18	Str.	A. E. Ames	Ran into Grand Trunk bridge, damaging it severely; harbor blocked about a week by accident	Lake Michigan.
May 18	Sch.	J. B. Lozen	Hit light on extension of east arm; not damaged	Hamilton, Ont.
May 18	Str.	Conemaugh	Ran aground; released by Favorite	Cleveland breakwater.
May 19	Str.	Iona	Burned to water's edge and then sank; loss estimated at $20,000..	Corsica Shoal, Lake Huron.
				Lake Ontario, near Oswego, N. Y.
May 19	Str.	Victory	Collided with Str. L. B. Miller; slightly damaged	St. Clair river.
May 19	Str.	L. B. Miller	Collided with Str. Victory; slightly damaged	St. Clair river.
May 20	Str.	A. E. McKinstry	Collided with Str. Corunna; two plates damaged and five frames broken. Repaired at Kingston	
May 20	Str.	Corunna	Collided with steamer McKinstry; slightly damaged	Welland canal.
———	Str.	H. P. Bope	In backing out of slip hit dock and broke her quadrant	Welland canal.
———	Str.	Toiler	Ran ashore; released on May 31 after lightering 35,000 bu. of grain. Docked at Kingston June 10	South Chicago.
				Foot of Galops Rapids, near Ogdensburg.
May 21	Str.	James Davidson	Eight men severely burned by bursting of steam pipe; steamer hastened to Marquette where injured were taken ashore; two died	Lake Superior.
May 23	Sand Str.	Mulinix	Turned turtle, engines and boilers dropping out; floated June 14; considerably damaged	Toledo, O.
May 23	Str.	India	Got a line in her wheel and ran on beach	Shelldrake.
———	Str.	J. Spaulding	Lost her rudder; anchored off Cheboygan; tug sent to her from Sault which steered her to Milwaukee, whither she was bound; docked for new rudder	
May 27	Str.	Frontenac	Collided with barge Chattanooga; hole pierced in her abreast the coal bunkers 4 ft. above water line, breaking the plates	Lake Huron.
May 27	Bge.	Chattanooga	Collided with Str. Frontenac; lost an anchor and broke hawse pipe	Off Grand Island, Lake Superior
May 28	Str.	Imperial	Broke four gates, delaying navigation considerably	Off Grand Island, Lake Superior
———	Str.	Arabian	Collision; lost her rudder in the rapids	Cornwall canal.
				St. Lawrence River, near Morrisburg.
May 30	Str.	Andaste	Collided with barge Thompson; hit on port side abreast of boiler-house; four plates cracked and damage extended down below water line; cargo hold began to fill and to prevent sinking she was beached. Accident occurred when Andaste endeavored to pass Str. Warner and her tow, the Thompson; floated May 31 after lightering 500 tons of ore and taken to Sault for temporary repairs; docked at Cleveland June 6 and repairs were completed on May 13; seven or eight damaged plates	
May 30	Bge.	A. W. Thompson	Collided with Str. Andaste; few plates bent; damage slight	Hay Lake, St. Marys river.
May 31	Str.	Joseph C. Suit	Struck by Str. City of Detroit III while on her trial trip, being torn from her moorings; sank; probably total loss	Hay Lake, St. Marys river.
June 4	Str.	W. H. Gratwick	While leaving port hit Str. Rensselaer	Detroit river.
June 4	Str.	Rensselaer	Hit by Str. W. H. Gartwick; cabin stove in and life boats carried away	Conneaut, O.
———	Str.	City of Bangor	While turning around; struck an obstruction and lost her wheel; towed to Cleveland; new wheel and hub put on	Conneaut, O.
June 4	Steel scow		Capsized in strong wind and sank; (towed by Str. Lakeside) probably total loss; valued at $20,000	Escanaba, Green Bay.
June 6	Str.	Frank J. Hecker	Ran ashore in fog; released herself, uninjured	
June 7	Str.	J. B. Nielson	In landing hit the dock; slightly damaged; repaired at Superior...	Near Crisp Point, Lake Superior
June 13	Str.	M. C. Smith	Hit by Main Ave. bridge but was not damaged; bridge damage estimated at $4,000 or $5,000	Two Harbors, Minn.
June 13	Str.	Viking	Ran hard aground; released on June 17, uninjured	Cleveland, O.
June 15	Str.	Bge. Pawnee	Broke her crank shaft; towed to Detroit for repairs	Toledo, O.
———	Str.	City of South Haven	Struck a log; docked at Chicago for repairs to her rudder	St. Clair river, near Port Huron
June 18	Str.	Rutland	Collided with Str. United States	Manistee, Mich.
June 18	Str.	United States	Collided with Str. Rutland	Chicago.
———	Str.	Cadillac	Ran aground; lightered; docked at Ashtabula; 20 damaged plates, half of which must be replaced; repairs completed July 5	Chicago.
June 20	Str.	Canadian	Carried away four gates of Lock 22; break repaired on June 21...	Deseronto, Ont.
———	Str.	Renvoyle	Struck; docked at Ashtabula June 21 for repairs	Welland canal.
———	Str.	Manitou	Ran ashore; tugs ordered to her from Sault	Kingston, Ont.
———	Str.	Shenango	Lost an anchor	Lonely island, Georgian bay.
				Near Sailors' Encampment, St. Marys river.
———	Str.	Wm. Nottingham	Lost an anchor	Below Poe Lock, Saulte canal.
June 20	Str.	George B. Leonard	Lost an anchor	Sandusky.
June 21	Str.	Holland	Broke her walking beam cylinder and piston rod; towed to Chicago	Lake Michigan.
June 22	Bge.	Harold	In tow of Str. P. J. Ralph when the steamer collided with the Str. Socapa; considerably damaged	Head of Stag Island, St. Clair river.
June 22	Str.	Socapa	Collided with Str. P. J. Ralph, towing the barge Harold; slightly damaged	Head of Stag Island, St. Clair river.
June 23	Str.	Neptune	Struck obstruction and broke two buckets off her wheel	St. Clair Flats canal.
———	Str.	C. O. Jenkins	Grounded; had to lighter	Cleveland harbor.
June 26	Str.	Bothnia	Collided with Str. Curry and nearly cut in two; one of crew drowned; total loss	St. Clair river near Star Island.
June 26	Str.	S. S. Curry	Collided with Str. Bothnia when her rudder became disabled; hole 6 x 8 ft. in her side; towed to Milwaukee by Str. Favorite; new rudder put on	St. Clair river near Star Island.
June 27	Str.	Sidney C. McLouth	Burned; total loss; crew rescued	Green bay.
June 27	Sch.	Francomb	Became waterlogged after she struck a submerged object; 100,000 ft. of lumber lightered and towed to Buffalo by Str. Mohegan; lost cargo estimated at $30.000	Near Southeast Shoal, Lake Erie
June 28	Str.	City of Montreal	Ran aground; out 30 in.; released on June 30 by three tugs	Maumee bay.
June 29	Str.	James Corrigan	Colliged with barge Alex. Maitland	Lower Detroit river.
June 29	Bge.	Alex. Maitland	Collided with Str. James Corrigan; slightly damaged; docked at Cleveland July 3	Lower Detroit river.
June 30	Str.	W. P. Snyder	Broke bolts in connecting rod of intermediate crank pin and cracked cylinder head; Str. Wilpen towed her to Ashtabula and from there to Ecorse for repairs; will need new cylinder head, connecting rod, piston rod and crank shaft; about two weeks to make repairs	Off Fairport, Lake Erie.
July 2	Str.	Crete	Collided with Str. J. S. Dunham; five plates damaged and eight frames buckled on her bow; to be repaired at Toledo	Southeast Bend, St. Clair river.
July 2	Str.	J. S. Dunham	Collided with Str. Crete; slightly damaged	Southeast Bend, St. Clair river.
July 3	Bge.	Alfred Krupp	Ran aground; released on July 4 by tug, after lightering 100 tons; leaked; docked at Cleveland July 5	Ballard's Reef, Detroit, Mich.
July 5	Str.	Viking	Ran ashore in dense fog; hold filled with water and reported by tugs to be in bad shape; probably will be abandoned as constructive total loss	Split Rock, Lake Superior.
July 6	Str.	Columbia	Considerably damaged by fire and may be total loss	Near Ogdensburg.
July 7	Str.	Normania	Ran aground	Ballard's Reef.

Date.	Name of Vessel.	Nature of accident.	Location.
———	Str. J. B. Wood	Lost an anchor	Middle Neebish Channel.
July 7	Str. Merida	In leaving channel in dense fog, ran aground on Canadian side; released after lightering on July 8 and went to Cleveland	Soo.
———	Str. Adriatic	Hit the bridge pier and dented a few plates	Soo.
July 8	Str. Wainwright	Ran aground; released by a tug from Buffalo; slightly damaged	Point Abino, Lake Erie.
———	Str. H. P. Bope	Struck; released and docked at Superior; bottom badly stove in under boiler; 22 plates damaged; two weeks in dry dock; repairs completed on July 26	Ballard's Reef, Detroit river.
July 13	Bge. C. G. King	Crashed into east pier while entering lower end St. Clair Flats canal; bow smashed and seams opened; sank immediately; raised July 23, temporarily repaired and left for Port Huron to unload coal cargo	St. Clair river.
July 14	Str. G. J. Grammer	Collided with Str. Northern Queen in heavy fog; sank immediately in 27 ft. of water; floated on July 17 and was temporarily patched up at Port Huron; big break in side and decks badly damaged; docked at Cleveland July 22; will lose three weeks' time in making repairs	Near Corsica Shoal, Lake Huron
July 14	Str. Northern Queen	Collided with Str. G. J. Grammer in heavy fog; bow badly damaged; accident caused by parting of her wheel chains; temporarily repaired at Port Huron	Near Corsica Shoal, Lake Huron
July 14	Oil Bge. No. 96	Hit by Str. B. F. Jones on port side abreast of pump room; bulkhead leaked and considerable other damage done; temporarily repaired at Sault; to be docked at Cleveland	Near Poe Lock, Sault canal.
July 14	Str. W. K. Bixby	Hit lightship Kewaunee stationed at wrecked steamer Joliet when her steering gear gave out; floated over the Joliet, doing considerable damage; forepeak full of water; tmporarily patched at Port Huron and docked at Ashtabula on July 18; 70 plates damaged; will be out of commission about four weeks, and repairs will cost approximately $30,000	St. Clair river.
July 14	Str. W. L. Smith	Ran on east bank; released by tug after lightering 300 tons of ore; reloaded lightered cargo; not damaged	Limekiln Crossing, Detroit river.
July 14	Dredge	Sank in 70 ft. of water when line parted in storm; crew rescued.	Near Ontonagon, Lake Superior.
July 15	Str. J. B. Nielson	Ran aground near T. & O. C. docks; released by tugs	Toledo, O.
July 15	Str. W. H. Mack	Hit breakwater; lost her shoe and rudder damaged; arrived at Detroit in crippled condition, unloaded there, and was towed to South Chicago and docked; repairs completed July 30	Buffalo.
July 16	Str. India	Crashed into Grand Trunk Ry. bridge, putting structure entirely out of commission; vessel only slightly injured. Misunderstanding of signals said to have caused accident	Port Colborne, Ont.
July 16	Str. Flora	Sank at dock, seams opening	Saginaw river.
July 16	Str. Andrew Carnegie	Collided with Str. Iron King; four plates damaged; repaired at Cleveland	Detroit river.
July 16	Str. Iron King	Collided with Str. Andrew Carnegie; bow badly damaged; temporarily repaired at Detroit and took on steam pump to finish trip; left Detroit on July 18; docked at Manitowoc	Detroit river.
July 16	Str. Bulgaria	Hit by Str. Theodore Wickwire Jr., while unloading at elevator; dock somewhat damaged	Buffalo.
———	Str. Geronia	Struck in canal and was beached at Picton; floated on July 17 and docked at Montreal	Lachine canal.
———	Sch. Chippewa	Sprang a leak and had to be beached at Ashtabula	Lake Erie, near Ashtabula.
———	Sch. Rob Roy	Sank in harbor, loaded with coal	Kingston harbor.
———	Str. Rosedale	Hit a canal lock; docked at Kingston July 19	———
July 18	Str. Paipoonge	Struck; released herself on July 19	Middle Ground, St. Clair river.
July 19	Str. United Lumberman	Ran on reef; released	Dawson Rock, Georgian bay.
July 19	Bge. Jeanette	In tow of Str. United Lumberman and also ran on	Dawson Rock, Georgian bay.
July 20	Str. R. L. Agassiz	Collided with Bge. Magna; bows pretty badly damaged above water line; nine plates must be replaced	Detroit river.
July 20	Bge. Magna	Collided with Str. Agassiz (in tow of Str. Alex. McDougall); big hole in side; towed to Detroit for temporary repairs	Detroit river.
July 20	Str. Francis Widlar	Stranded; released on July 22 after lightering 350 tons of ore; not seriously injured	Marine City, St. Clair river.
July 20	Str. Parks Foster	Ran aground; released on July 22 after lightering 10,000 bu. of grain; not seriously injured	Ballard's Reef, Detroit river.
July 21	Str. C. H. Green	Struck obstruction; broke two buckets off her wheel and damaged a third; docked at Port Huron	Soo river.
———	Str. Mary McGregor	Machinery became disabled; repaired at Port Huron	———
July 23	Str. America	Ran aground; lightered 300 or 400 tons of ore; docked at Cleveland on July 25; 17 damaged plates; ten days in dry dock	Detroit river
July 23	Str. Ogdensburg	Ran ashore in fog; released on July 24 after lightering 400 tons; docked at Chicago and will be out of commission about three weeks; 42 plates to come off, 15 of which must be replaced with new; repair bill estimated at $20,000	North Point, Lake Michigan.
July 25	Str. Eastland	Ran on east end of breakwater; few plates damaged and rivets loosened	Cleveland breakwater.
———	Str. Britannia	Docked at Detroit for repairs to her wheel	———
———	Str. Gen. Garretson	Struck; docked at Lorain July 27 for repairs; 17 plates damaged.	Ballard's Reef, Detroit river.
———	Str. Westmount	Collided with Str. Turret Court; went to Port Arthur ship yard on July 27 for repairs	———
July 27	Str. Mataafa	Collided with Str. G. Watson French; arrived at Detroit in almost sinking condition, where she was temporarily repaired and left on July 29 for Toledo where she was docked; hull broken for a distance of 100 ft. on port side and deck forward bulged up; 50 frames damaged; will be about three weeks in dry dock; repair bill estimated at $25,000	Lake St. Clair, Off Grosse Point.
July 27	Str. G. Watson French	Collided with Str. Mataafa; disabled steering gear cause of accident; port bow stove in above water line; lost one anchor; went back to Ecorse for temporary repairs and then left for Fort William	Lake St. Clair, Off Grosse Point.
July 29	Str. Republic	Ran ashore in fog; released on July 30 after lightering 800 tons of ore; badly damaged forward and tank top sprung, causing water to enter cargo hold; temporarily repaired at Sault	Brush Point, St. Mary's river.
July 29	Bge. I. L. Bell	Hit by Str. Moses Taylor; three plates damaged, nine frames and eight deck beams; docked at Lorain	Lorain harbor.
July 29	Str. Amasa Stone	Backed into dock, breaking quadrant and damaging her rudder; will be delayed four or five days	Duluth.
———	Str. Theodore Roosevelt	Collided with tug Perfection; rudder damaged	Chicago.

Photographic Reference Library

The Detroit Publishing Co., Detroit, Mich., has for some time past been working upon a picture reference library, in which will be incorporated a somewhat elaborate marine division. This division will have several sections treating with noted historical scenes and ships, such as the Frigate Constellation, Nelson's Flagship Victory at Trafalgar. The second section would show the various types of naval vessels. A third section would display the merchant marine divided into ocean sail and steam types as well as lake.

The Electric Rudder or Helm Angle Indicator

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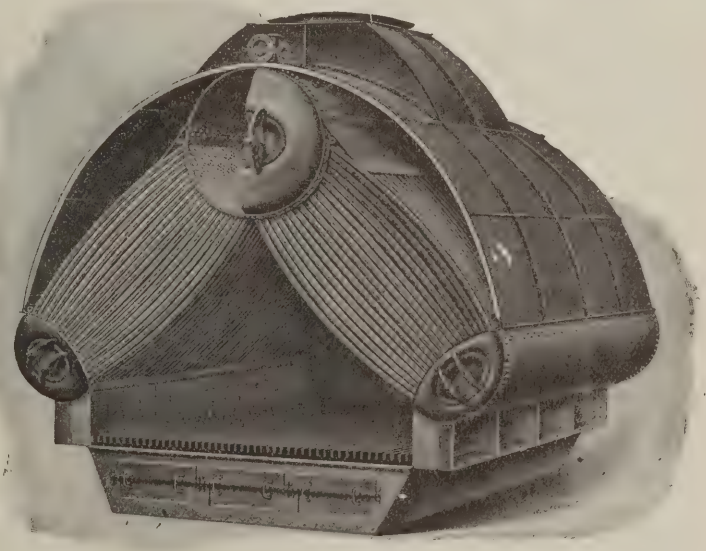

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Fig. 1 represents a bar 1⅛ in. in diameter, bent cold flat on itself and retaining a smooth surface with no rupture. The extreme ductility of this iron is shown by the distance the molecules had to float without rupture in following the curve described in bending the bar.

Fig. 2 represents a bar 1⅛ in. in diameter nicked 1/16 in. deep one-half way around and bent flat on itself to produce rupture and show the fibrous structure of the iron and the stretch at the hollow portion. It also shows the standard V thread, 12 per in., when bent flat on itself. Although each thread is the equivalent to the nick which ruptured the other end, no rupture is readily apparent, there being very minute ruptures at the base of every thread, thus demonstrating the complete uniformity of the fibrous structure.

The advantage of the hollow feature of this material is of special interest since the passage of the federal boiler

FIG. 2.

Inspection Act, as the rules adopted for the enforcement of that act have certain requirements which are most easily and

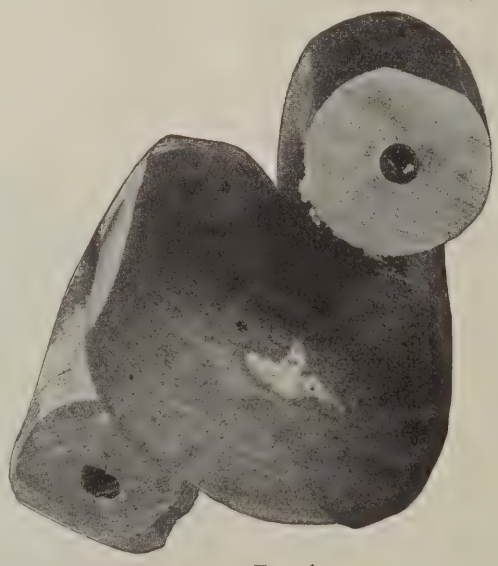

FIG. 1.

economically met by hollow staybolt iron. One of these rules requires that all staybolts shorter than 8 in. applied after July 1, 1911, except flexible staybolts, shall have tell-tale holes 3/16 in. in diameter, not less than 1¼ in. deep in the outer end, and these holes must be kept open at all times. As is well known, the Falls hollow staybolt iron has 3/16 in. holes clear through, so that the time and expense required for drilling every staybolt is avoided by the use of the hollow bolt.

Life Raft of Perry Design

The La Favorite Rubber Mfg. Co., Paterson, N. J., manufacturer of Perry's specialties, are endeavoring to revive interest in life rafts of design similar to Perry's raft Nonpareil, which crossed the Atlantic ocean in 1867. The Nonpareil left Southampton on June 12 and arrived in New York on July 26. The raft is constructed of either two or three cylinders, which can be inflated by hand or compressed air. It is claimed for the rafts that they cannot be swamped or capsized in a seaway or in the breakers. The capacity of the two-cylinder raft is 11,500 lb., and the three-cylinder 17,000 lb. The Nonpareil which crossed the ocean was schooner-rigged. The great interest now obtaining in life-saving equipment, owing to the Titanic disaster, has caused the La Favorite company to revive interest in the device.

Straus Bascule Bridge

The Straus design of bascule bridge was displayed in model form at the recent convention of the International Navigation Congress in Philadelphia and was inspected quite generally by the delegates. This type of bridge has recently been adopted by the Great Northern railroad for a 200 ft. single leaf double track bridge over the Salmon Bay waterway at Seattle; by the Northern Pacific for a 190 ft. single leaf, single track bridge at Seattle and by the Houston Belt and Terminal railway for a 116 ft. 6 in. single leaf bridge over Buffalo bayou at Houston, Texas.

The Duff Mfg. Co., of Pittsburgh, Pa., exclusive manufacturer of Barret lifting jacks, have purchased five acres of ground on Preble avenue, Northside, Pittsburgh, on the lines of the Pennsylvania and Baltimore & Ohio railroads, and will start at once the erection of a new factory, which it is said will be the largest in the world devoted exclusively to the manufacture of lifting jacks.

Recording compasses furnished by the Schuette Recording Compass Co., of Manitowoc, Wis., are being installed on the new passenger steamer Tabora, of the German East African Line, and on the Professor Worman, of the Worman Line.

The Fumigating & Fire Extinguishing Co. of America, 29 Broadway, fumigated the steamer Denver, of the Mallory Line, recently.

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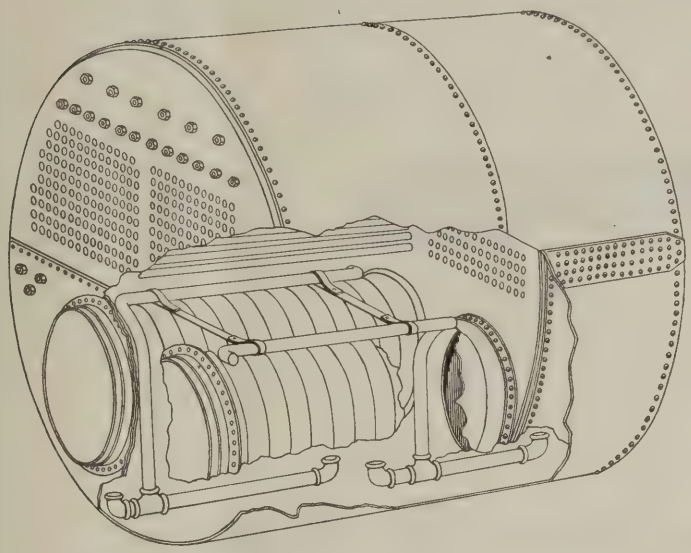

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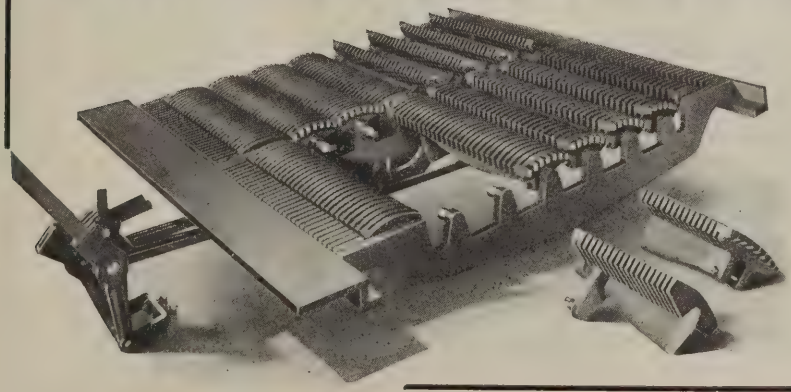

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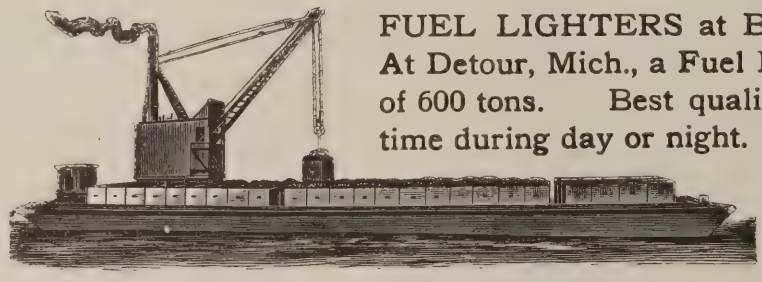

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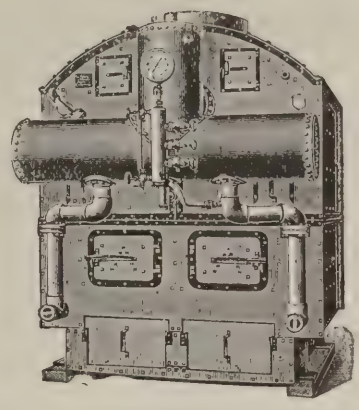

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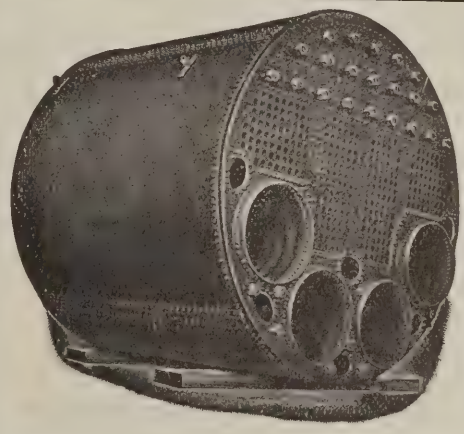

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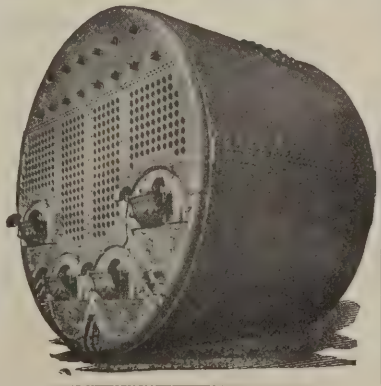

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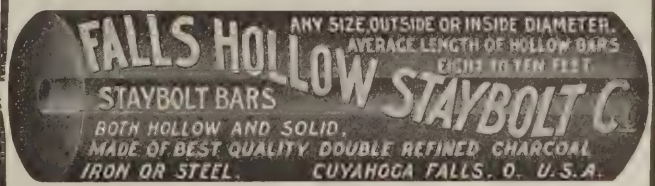
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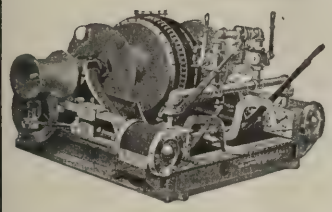

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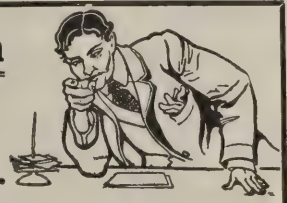

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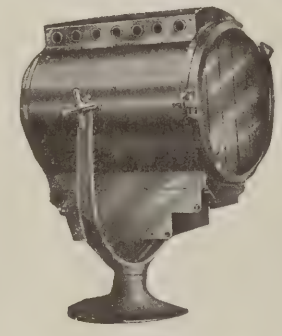

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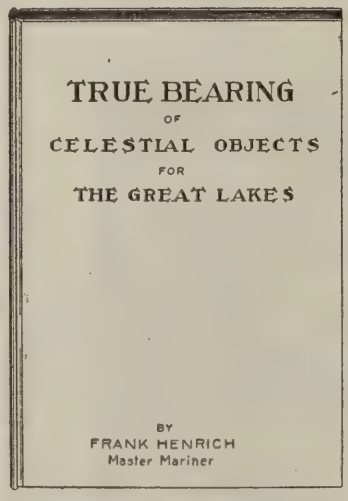

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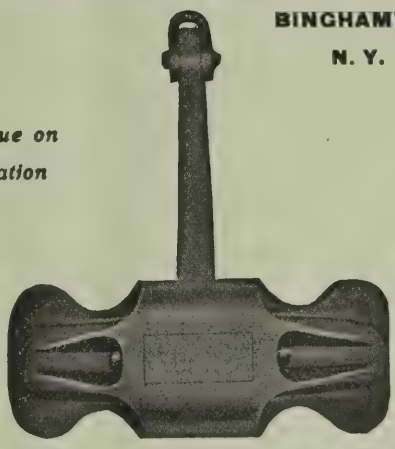

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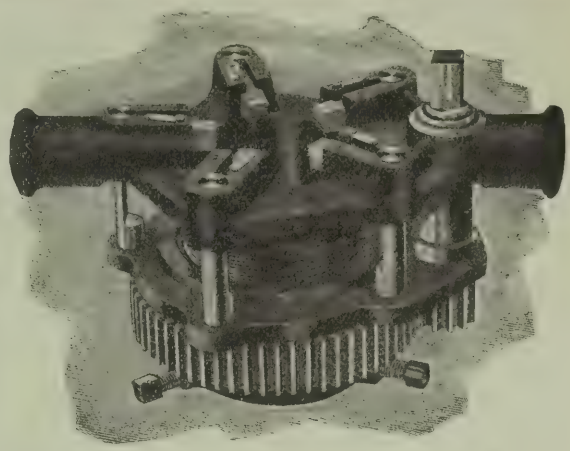

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(Vessel and Freight.)

Boland & Cornelius..... 97
Hawgood & Co., W. A..... 97
Hutchinson & Co..... 97
McCarthy, T. R..... 97
Richardson, W. C..... 97
Vance & Joys Co..... 97

ANCHORS.
American Engineering Co..... 2
Bowers & Co., L. M..... 87

APPARATUS.—(Steering.)
American Ship Building Co..... 5
Chase Machine Co..... 10
Dake Engine Co..... 13
Detroit Ship Building Co..... 5
Hyde Windlass Co..... 100
Sheriffs Mfg. Co..... 91

APPARATUS.—(Submarine Diving.)
Morse & Son, A. J..... 84
Schrader's Son, Inc., A..... 86

ARCHITECTS.—(Naval.)
Andrews, W. L..... 96
Babcock & Penton..... 96
Brady, F. W..... 96
Curr, Robert..... 96
Furstenau, M. C..... 96
Kidd, Joseph & Son, Duluth, Minn..... 96
Hynd, Alexander..... 96
Nevins, W. T..... 96
Watts, J. Murray..... 97

ARMORS.—(Submarine.)
Morse & Son, A. J..... 84
Schrader's Son, Inc., A..... 86

ASBESTOS PRODUCTS.
Johns-Manville Co., H. W..... 19

ATTORNEYS AND PROCTORS IN ADMIRALTY.
Gilchrist, Albert J..... 96
Goulder, Day, White, Garry & Duncan.. 96
Holding, Masten, Duncan & Leckie..... 96
Hoyt, Dustin, Kelley, McKeehan & Andrews..... 96
Kremer, C. E..... 96
Shaw, Warren, Cady & Oakes..... 96

BARS—(Iron or Steel—Hollow Staybolt)
Falls Hollow Staybolt Co..... 83

BEACONS.
Safety Car Heating & Lighting Co..... 12

BELLS.—(Engine Room, Telegraph, Call, Etc.)
Cory & Sons, Chas..... 12
National Tube Co..... 15

BINNACLES.
Ritchie, E. S., & Sons..... 91

BLOCKS.—(Tackle.)
Boston & Lockport Block Co..... 91

BOATS.—(Builders.)
Drein, Thomas. & Son..... 97
Kahnweiler's Sons, David..... 99

BOOKS.
Penton Publishing Co., The.....

BOILERS.—(Marine.)
Almy Water Tube Boiler Co..... 83
American Ship Building Co..... 5
Babcock & Wilcox Co..... 279
Bath Iron Works..... 11
Chicago Ship Building Co..... 6
Clyde Shipbuilding & Engrg. Co..... 11
Commercial Boiler Works..... 83
Delaney, P., & Co..... 83
Detroit Ship Building Co..... 5
Fletcher, W. A., & Co..... 10
Great Lakes Engrg. Works..... 22
Johnston Bros. 8
Kingsford Fdy. & Mach. Works..... 83
Manitowoc Ship Bldg. & Dry Dock Co... 9
Milwaukee Dry Dock Co..... 7
Mosher Water Tube Boiler Co..... 279
Superior Ship Building Co..... 6
Toledo Ship Building Co..... 4

BRASS GOODS.
Penberthy Injector Co..... 100

BUOYS, BOATS, PRESERVERS, ETC. (Life.)
Drein & Son, Thos..... 97
Kahnweiler's Sons, David..... 99

BUOYS.—(Gas.)
Safety Car Heating & Lighting Co..... 12

BUOYS.—(Spar.)
Safety Car Heating & Lighting Co..... 12

BUSHINGS.—(Adjustable.)
Armstrong Mfg. Co..... 99

WHERE TO BUY

CABLES.

American Steel & Wire Co..... 17
Columbian Rope Co..... 81
Durable Wire Rope Co..... 16
Standard Chain Co..... 16
Wall Rope Works..... 16

CAPSTANS.

American Engineering Co..... 2
Chase Machine Co..... 10
Dake Engine Co..... 13
Hyde Windlass Co..... 100

CASTINGS.—(Brass and Bronze.)

Dake Engine Co..... 13
Great Lakes Engineering Works..... 22
Trout Co., H. G..... 91

CASTINGS.—(Steel.)

Otis Steel Co., Ltd..... 19

CHAINS.

Standard Chain Co..... 16

CHAINS.—(Anchor and Cable.)

Standard Chain Co..... 16

CHAINS.—(Crane.)

Standard Chain Co..... 16

(CHAINS.—(Dredge.)

Standard Chain Co..... 16

CHAINS.—(Hoisting.)

Standard Chain Co..... 16

CHAINS.—(Ship.)

Standard Chain Co..... 16

CHAINS.—(Steam Shovel.)

Standard Chain Co..... 16

CHAINS.—(Steering Gear.)

Standard Chain Co..... 16

CHARTS.

Penton Publishing Co., Cleveland, O..

CHOCKS.

American Engineering Co..... 2

CIRCULATORS—(Boiler.)

Eckliff Automatic Boiler Circulator Co.... 81

COAL.—(Producers and Shippers.)

Hall, Geo., Coal Co..... 85
Hanna, M. A., & Co..... 82
Lorain Coal & Dock Co..... 82
Pickands, Mather & Co..... 82

COCKS.

National Tube Co..... 15

COILS.—(Pipe.)

National Tube Co..... 15

COLUMNS.—(Gage—Water.)

National Tube Co..... 15

COMPASSES.

Ritchie, E. S., & Sons..... 91

COMPASSES.—(Recording.)

Schuette Recording Compass Co..... 84

CONDENSERS.

American Engineering Co..... 2
Great Lakes Engrg. Works..... 22
Griscom-Spencer Co. 99

CONTRACTORS.—(Dredging.)

Breymann & Bros., G. H..... 92
Buffalo Dredging Co..... 93
Dunbar & Sullivan Dredging Co..... 92
Great Lakes Dredge & Dock Co..... 20
Starke Dredge & Dock Co., C. H..... 92
Sullivan, M..... 93

CONTRACTORS.—(Pile Driving and Sub-Marine.)

Buffalo Dredging Co..... 93
Dunbar & Sullivan Dredging Co..... 92
Great Lakes Dredge & Dock Co..... 20
Starke Dredge & Dock Co., C. H..... 92
Sullivan, M..... 93

CONTRACTORS.—(Public Work.)

Breymann & Bros., G. H..... 92
Buffalo Dredging Co..... 93
Dunbar & Sullivan Dredging Co..... 92
Great Lakes Dredge & Dock Co..... 20
Starke Dredge & Dock Co., C. H..... 92
Sullivan, M..... 93

CONVEYORS.—(Chain.)

Bartlett & Snow Co., C. O..... 84
General Electric Co..... 21

CORDAGE.

Columbian Rope Co..... 81

COUPLINGS.

National Tube Co..... 15

CRANES.

General Electric Co..... 21

CRANES.—(Dock.)

American Engineering Co..... 2

CRANES—(Electric Boat.)

American Engineering Co..... 2
General Electric Co..... 21

CRANES.—(Locomotive.)

American Engineering Co..... 2

CUPS.—(Oil and Grease.)

Penberthy Injector Co..... 100

CUTTERS.—(Pipe.)

Armstrong Mfg. Co..... 99

DERRICKS.

Dake Engine Co..... 13
Lidgerwood Mfg. Co..... 85
Superior Iron Works..... 81

DESIGNERS.—(Ship.)

Andrews, W. L..... 96
Babcock & Penton..... 96
Curr, Robert..... 96
Furstenau, M. C..... 96
Hynd, Alexander 96
Kidd, Joseph.....Duluth, Minn 96

DIES.

Armstrong Mfg. Co..... 99

DIVING APPARATUS.

Morse & Son, A. J..... 84
Schrader's Son, Inc., A..... 86

DOCKS.—(Dry.)

American Ship Building Co..... 5
Buffalo Dry Dock Co..... 7
Chicago Ship Building Co..... 6
Collingwood Ship Building Co..... 8
Detroit Ship Building Co..... 5
Great Lakes Engrg. Works..... 22
Manitowoc Ship Bldg. & Dry Dock Co... 9
Milwaukee Dry Dock Co..... 7
Superior Ship Building Co..... 6
Tietjen & Lang Dry Dock Co..... 10
Toledo Ship Building Co..... 4

DRAFT.—(Artificial and Mechanical for Boilers.)

American Ship Building Co..... 5
Detroit Ship Building Co..... 5
Great Lakes Engrg. Works..... 22

DROPS.—(Wharf.)

American Engineering Co..... 2

DYNAMOS.

General Electric Co..... 21

EJECTORS.

Penberthy Injector Co..... 100

EJECTORS.—(Ash.)

Great Lakes Engrg. Works..... 22

ENGINE PROPELLERS.

Lockwood Mfg. Co..... 84

ENGINEERS.—(Marine, Mechanical and Consulting.)

Andrews, W. L..... 96
Babcock & Penton..... 96
Brady, F. W..... 96
Furstenau, M. C..... 96
Griscom-Spencer Co. 99
Hunt, Robt. W., & Co..... 96
Hynd, Alexander 96
Kidd, Joseph, & Sons.....Duluth, Minn. 96
Nevins, W. T..... 96
Roelker, H. B. 14
Watts, J. Murray..... 97

ENGINES.

American Engineering Co..... 2
Chase Machine Co..... 10
Superior Iron Works..... 81

ENGINES.—(Hoisting.)

American Engineering Co..... 2
Chase Machine Co..... 10
Lidgerwood Mfg. Co..... 85

ENGINES.—(Marine.)

American Ship Building Co..... 5
Bath Iron Works..... 11
Chicago Ship Building Co..... 6
Chase Machine Co..... 10
Clyde Ship Building Co..... 11
Collingwood Ship Building Co..... 8
Detroit Ship Building Co..... 5
Fletcher, W. A., Co..... 10
Fore River Ship Building Co..... 97
Great Lakes Engrg. Works..... 22
Johnston Bros. 8
Lidgerwood Mfg. Co..... 85
Manitowoc Ship Building & Dry Dock Co. 9
Milwaukee Dry Dock Co..... 7
Sheriffs Mfg. Co..... 91
Superior Ship Building Co..... 6
Toledo Ship Building Co..... 4
Trout, H. G..... 91

ENGINES.—(Mooring.)

American Engineering Co..... 2
Chase Machine Co..... 10
Lidgerwood Mfg. Co..... 85

ENGINES.—(Steering.)

American Engineering Co..... 2
Hyde Windlass Co..... 100
Lidgerwood Mfg. Co..... 85

EVAPORATORS.

Griscom-Spencer Co. 99

EXTRACTORS.—(Grease.)

Griscom-Spencer Co. 99

FASTENERS.—(Hatch.)

Hynd, Alexander 96

FILTERS.—(Feed Water.)

Griscom-Spencer Co. 99
Ross Valve Mfg. Co..... 12

FIRE EXTINGUISHERS.

Fumigating & Fire Extinguishing Co. of America. 84

FITTINGS.—(Boiler.)

National Tube Co..... 15

FITTINGS.—(Pipe.)

National Tube Co..... 15

FIXTURES.—(Lamp.) (Oil and Electric.)

General Electric Co..... 21

FUELING COMPANIES AND COAL DEALERS.

Hall, Geo., Coal Co..... 85
Hanna & Co., M. A..... 82
Lorain Coal & Dock Co..... 82
Pickands, Mather & Co..... 82

FURNACES.—(For Boilers.)
Continental Iron Works..... 2

GAGES.—(Steam.)
Ashton Valve Co..... 15

GAGES.—(Water.)
Penberthy Injector Co..... 100

GASKETS.
Johns-Manville Co., H. W..... 19

GEARS.—(Steering.)
American Engineering Co..... 2
American Ship Building Co..... 5
Chase Machine Co..... 10
Dake Engine Co..... 13
Detroit Ship Building Co..... 5
Hyde Windlass Co..... 100
Sheriffs Mfg. Co..... 91
Standard Chain Co..... 16

GENERATORS.
General Electric Co..... 21

GRAPHITE.
Dixon Crucible Co., Joseph..... 99
Johns-Manville Co., H. W..... 19

GRAPHITE.—(Lubricating.)
Dixon Crucible Co., Joseph..... 99

GYPSEYS.—(Steam.)
American Engineering Co..... 2

HAMMERS.—(Steam.)
Chase Machine Co..... 10
Griscom-Spencer Co. 99

HEATERS AND PURIFIERS.—(Feed-Water.)
Griscom-Spencer Co..... 99
Ross Valve Mfg. Co..... 12

HOISTERS.—(Ferrall's Cargo.)
Boston & Lockport Block Co..... 91

HOISTS.—(Air.)
Great Lakes Engrg. Works..... 22

HOISTS.—(Cargo, Etc.)
American Engineering Co..... 2
American Ship Building Co..... 5
Boston & Lockport Block Co..... 91
Chase Machine Co..... 10
Dake Engine Co..... 13
General Electric Co..... 21
Hyde Windlass Co..... 100

HOISTS.—(Chain.)
Dake Engine Co..... 13

HOISTS.—(Electric.)
American Engineering Co..... 2
General Electric Co..... 21
Lidgerwood Mfg. Co..... 85

HOISTS.—(Pneumatic.)
Dake Engine Co..... 13

INJECTORS.
Penberthy Injector Co..... 100

INSTRUMENTS.—(Nautical.)
Nicholson Ship Log Co..... 84
Ritchie, E. S., & Sons..... 91
Schuette Recording Compass Co..... 84

INSULATION.—(Asbestos and Electrical.)
Johns-Manville Co., H. W..... 19

INSURANCE.—(Marine.)
Boland & Cornelius..... 97
Hawgood, W. A., & Co..... 97
Hutchinson & Co..... 97
McCarthy, T. R..... 97
Richardson, W. C., & Co..... 97
Vance & Joys Co..... 97
Willcox, Peck & Hughes..... 86

IRON.—(Pig.)
Hanna & Co., M. A..... 82
Pickands, Mather & Co..... 82

JACKETS.—(Cork.)
Kahnweiler's Sons, David..... 99

JOINTS.—(Expansion.)
National Tube Co..... 15

LAMPS.—(Arc.)
General Electric Co..... 21

LANTERNS.—(Buoy.)
Safety Car Heating & Lighting Co..... 12

LAUNCHES.
Drein, Thos., & Son..... 97

LIFE PRESERVERS.
Justus Brauer & Son..... 97

LIGHTS.—(Electric.)
Cory & Son, Chas..... 12
General Electric Co..... 21

LOGS.
Nicholson Ship Log Co..... 84
Schuette Recording Compass Co..... 84
Walker & Sons, Thomas..... 3

LUBRICATORS.
Penberthy Injector Co..... 100

LUMBER.
Martin-Barriss Co..... 20

MACHINERY.—(Coal and Ore Handling.)
Bartlett, C. O., & Snow Co..... 84

MACHINERY.—(Dredging.)
American Engineering Co..... 2
Chase Machine Co..... 10
Great Lakes Engrg. Works..... 22
Superior Iron Works..... 81

MACHINERY.—(Marine.)
American Ship Building Co..... 5
Chase Machine Co..... 10
Chicago Ship Building Co..... 6
Clyde Ship Building Co..... 11
Collingwood Ship Building Co..... 8
Dake Engine Co..... 13
Detroit Ship Building Co..... 5
Fletcher Co., W. & A..... 10
Fore River Ship Building Co..... 97
Great Lakes Engineering Works..... 22
Johnston Bros. 8
Manitowoc Ship Bldg. & Dry Dock Co.. 9
Sheriffs Mfg. Co..... 91
Superior Iron Works..... 81
Superior Ship Building Co..... 6
Toledo Ship Building Co..... 4

MACHINERY.—(Refrigerating.)
Great Lakes Engineering Works..... 22
Roelker, H. B. 14

MACHINES.—(Towing.)
American Engineering Co..... 2
Chase Machine Co..... 10

MACHINISTS.
Chase Machine Co..... 10
Superior Iron Works..... 81

MOTORS—(Electric.)
General Electric Co..... 21

NOZZLES.—(For Fire Hose.)
Morse & Son, A. J..... 84

OAKUM.
Davy, W. O., & Sons..... 279
Stratford Oakum Co., Geo..... 14

OILS AND LUBRICANTS.
Dixon Crucible Co., Joseph..... 99

ORE.—(Iron.)
Hanna & Co., M. A..... 82
Pickands, Mather & Co..... 82

PACKING.
Home Rubber Co..... 14
Johns-Manville Co., H. W..... 19
Katzenstein, L., & Co..... 14

PACKING.—(Metallic.)
Johns-Manville Co., H. W..... 19
Katzenstein, L., & Co..... 14
Metallic Packing & Mfg. Co..... 85

PACKING.—(Sheet Rubber.)
Johns-Manville Co., H. W..... 19

PACKING.—(Spiral and Coil—Steam.)
Johns-Manville Co., H. W..... 19

PATENTS.
Siggers & Siggers 97

PIPE.
National Tube Co..... 15

PIPE COVERING.
Johns-Manville Co., H. W..... 19

PIPE THREADERS.
Toledo Pipe Threading Machine Co..... 87

PLANTS.
(Ice Making.)
Roelker, H. B. 14

PLATES AND SHAPES.
(Ship and Boiler.)
Otis Steel Co., Ltd..... 19

PRESERVERS.
(Life, Life Boats, Buoy, Etc.)
Drein, Thos., & Son..... 97
Kahnweiler's, David, Sons..... 99

PROJECTORS.—(Electric.)
Carlisle & Finch Co..... 86
General Electric Co..... 21

PUMPS AND APPLIANCES.
(Air.)
Great Lakes Engineering Works..... 22
Kingsford Fdy. & Machine Co..... 83

PUMPS.
(For Various Purposes.)
Great Lakes Engineering Works..... 22
Kingsford Fdy. & Machine Co..... 83
Roelker, H. B. 14

RADIATORS.
National Tube Co..... 15

REGULATORS.
(Pressure.)
Ross Valve Mfg. Co..... 12

WHERE TO BUY

REPAIRS.
(Marine.)

American Ship Building Co..... 5
Buffalo Dry Dock Co..... 7
Chicago Ship Building Co..... 6
Clyde Ship Building & Engrg. Co..... 11
Collingwood Ship Building Co..... 8
Delaney, P., & Co..... 83
Detroit Ship Building Co..... 5
Fore River Ship Building Co..... 97
Goldschmidt Thermit Co..... 279
Great Lakes Engineering Works..... 22
Griscom-Spencer Co..... 99
Johnston Bros. 8
Manitowoc Ship Bldg. & Dry Dock Co.. 9
Michigan Salt Works..... 100
Milwaukee Dry Dock Co..... 7
St. Lawrence Marine Ry. Co..... 85
Sheriffs Mfg. Co..... 91
Superior Ship Building Co..... 6
Tietjen & Lang Dry Dock Co..... 10
Toledo Ship Building Co..... 4

RINGS.
(Cork.)

Kahnweiler's Sons, David..... 99

RIVETS.
(Steel for Ships and Boilers.)

Great Lakes Engineering Works..... 22

ROPE.

Columbian Rope Co..... 81
Durable Wire Rope Co..... 16
Wall Rope Works of New York..... 16

ROPE AND FITTINGS.
(Wire.)

American Steel & Wire Co..... 17
Durable Wire Rope Co..... 16

SCOWS.
(Fueling.)

Bartlett, C. O., & Snow Co..... 84

SEARCH LIGHTS.

Carlisle & Finch Co..... 86
General Electric Co..... 21

SETS.
(Marine Electric.)

Carlisle & Finch Co..... 86
General Electric Co..... 21

SHAPES AND PLATES.
(Ship and Boiler.)

Otis Steel Co., Ltd..... 19

SHEAVES.

Boston & Lockport Block Co... 91

SHIP BUILDING SYSTEM.

Isherwood, J. W..... 3

SHIPS.
(Builders.)

American Ship Building Co..... 5
Bath Iron Works..... 11
Buffalo Dry Dock Co..... 7
Chicago Ship Building Co..... 6
Clyde Ship Building & Engrg. Co..... 11
Collingwood Ship Building Co..... 8
Detroit Ship Building Co..... 5
Fletcher Co., W. & A..... 10
Fore River Ship Building Co..... 97
Great Lakes Engineering Works..... 22
Isherwood, J. W..... 3
Johnston Bros. 8
Manitowoc Ship Building & Dry Dock Co. 9
Milwaukee Dry Dock Co..... 7
Superior Ship Building Co..... 6
Tietjen & Lang Dry Dock Co..... 10
Toledo Ship Building Co..... 4

SPECIALTIES.
(Steam.)

Griscom-Spencer Co. 99
Hynd, Alexander 96
Penberthy Injector Co..... 100
Ross Valve Mrg. Co..... 12

STAYBOLTS.
(Boiler—Iron or Steel, Hollow or Solid.)

Falls Hollow Staybolt Co..... 83

STEAMSHIP LINES.
(Passenger and Freight.)

American Line 84
International Mercantile Marine Co..... 84

STEERING GEARS.

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STOCKS.

Armstrong Mfg. Co..... 99

STOKERS.

American Engineering Co..... 2
Babcock & Wilcox Co..... 279

STOPPERS.
(Boiler-Tube.)

Griscom-Spencer Co..... 99

STOPPERS.
(Chain.)

American Engineering Co..... 2

STOPS.—(Engine Safety.)

Metallic Packing & Mfg. Co..... 85

SUPERHEATERS.
(Marine.)

Babcock & Wilcox Co..... 279

SUPPLIES AND SPECIALTIES.
(Engineers'.)

Griscom-Spencer Co. 99
National Tube Co..... 15
Penberthy Injector Co..... 100
Ross Valve Mfg. Co..... 12

SUPPLIES.
(Fire Department.)

Morse & Son, Inc., Andrew..... 84
Hynd, Alexander 96

SUPPLIES.
(Marine.)

Griscom-Spencer Co..... 99

SURVEYORS.
(Marine.)

Andrews, W. L..... 96
Babcock & Penton..... 96
Curr, Robert 96
Furstenau, M. C..... 96
Hunt & Co., Robert W..... 96
Hynd, Alexander 96
Nevins, W. T..... 96
Kidd, Joseph, & Son.....Duluth, Minn. 96

SWITCHBOARDS.

General Electric Co..... 21

TANKS.

Bath Iron Works..... 11
National Tube Co..... 15

TESTS OF MATERIALS.

Andrews, W. L..... 96
Babcock & Penton..... 96
Curr, Robert 96
Furstenau, M. C..... 96
Hunt & Co., Robert W..... 96
Hynd, Alexander 96
Kidd, Joseph, & Son.....Duluth, Minn. 96

THERMIT.

Goldschmidt Thermit Co..... 279

TIMBER.
(Ship.)

Martin-Barriss Co. 20

TRAPS.
(Steam.)

National Tube Co..... 15

TUBES.

National Tube Co..... 15

TUBING.
(Seamless.)

National Tube Co..... 15

TUGS.

Bath Iron Works..... 11

TURBINES

Bath Iron Works..... 11
Fletcher, W. A., & Co..... 10
Fore River Ship Building Co..... 97

TWINE AND YARN.
(Tarred Sisal.)

Columbian Rope Co..... 81
Wall Rope Works..... 16

UNIONS.

National Tube Co..... 15

VALVES.

Hynd, Alexander 96
National Tube Co..... 15
Penberthy Injector Co..... 100
Ross Valve Mfg. Co..... 12

VALVES.
(For Water and Gas.)

Ashton Valve Co..... 15
National Tube Co..... 15
Ross Valve Mfg. Co..... 12

VESSELS FOR SALE.
(Steam.)

Boland & Cornelius..... 97
McCarthy, T. R..... 97
Richardson, W. C., & Co..... 97

WELDING.

Great Lakes Welding Co..... 84
Michigan Salt Works..... 100

WELDING.
(Flue.)

Fix's, S., Sons..... 84
Great Lakes Welding Co..... 84
Michigan Salt Works..... 100

WELDING PROCESSES.

Goldschmidt Thermit Co..... 279

WHEELS.
(Propeller.)

American Ship Building Co..... 5
Case & Son, A., Wells..... 91
Detroit Ship Building Co..... 5
Fore River Ship Building Co..... 97
Great Lakes Engineering Works..... 22
Hyde Windlass Co..... 100
Milwaukee Dry Dock Co..... 7
Roelker, H. B..... 14
Sheriffs Mfg. Co..... 91
Superior Ship Building Co..... 6
Toledo Ship Building Co..... 4
Trout, H. G..... 91

WINCHES.

American Engineering Co..... 2
Chase Machine Co..... 10
Hyde Windlass Co..... 100
Lidgerwood Mfg. Co..... 85

WINDLASSES.

American Engineering Co..... 2
American Ship Building Co..... 5
Dake Engine Co..... 13
Hyde Windlass Co..... 100

WIRE.

American Steel & Wire Co..... 17

WOODS.
(Cabin and Cabinet Finishing.)

Martin-Barriss Co. 20

WORK.
(Submarine.)

Buffalo Dredging Co..... 93
Dunbar & Sullivan Dredging Co..... 92
Great Lakes Dredge & Dock Co..... 20
Starke Dredge & Dock Co., C. H..... 92
Sullivan, M. 93

YACHTS.
(Builders.)

Bath Iron Works..... 11

YAWLS.

Drein, Thos., & Son..... 97
Manitowoc Ship Bldg. & Dry Dock Co.. 9

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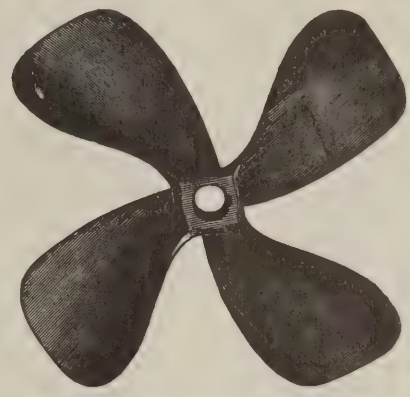

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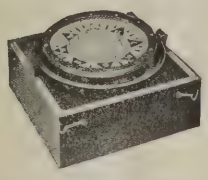

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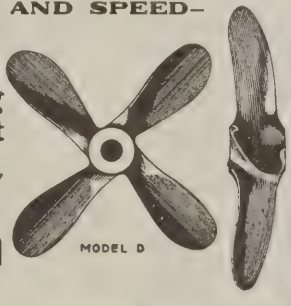

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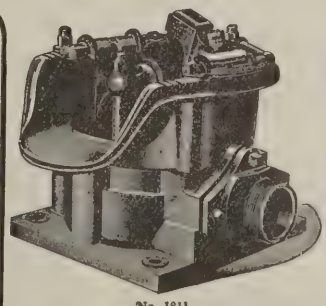

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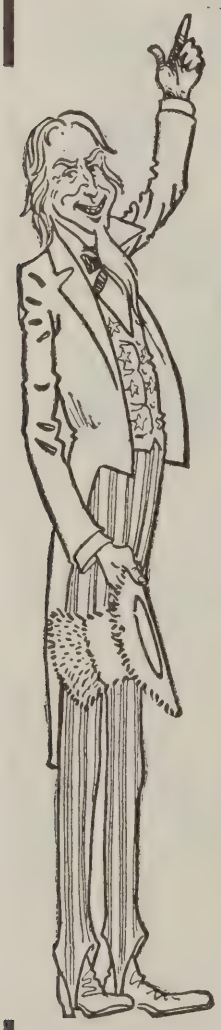

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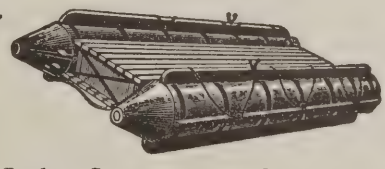

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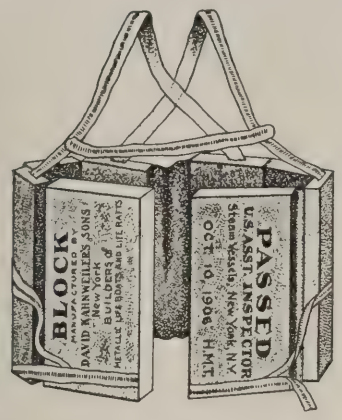

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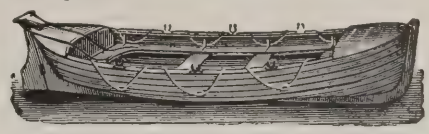

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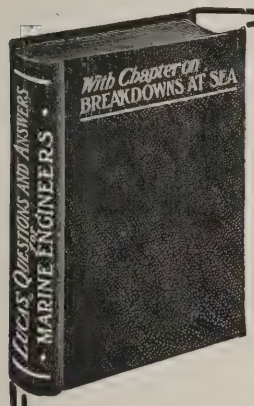

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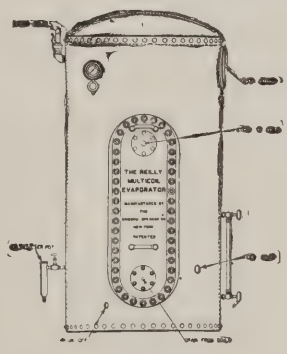

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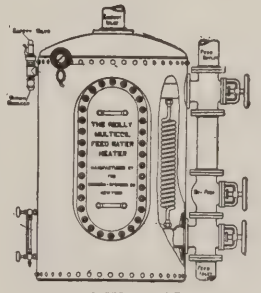

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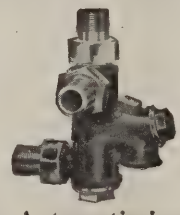

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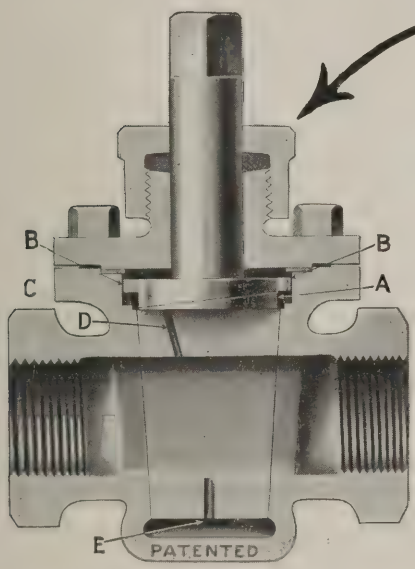

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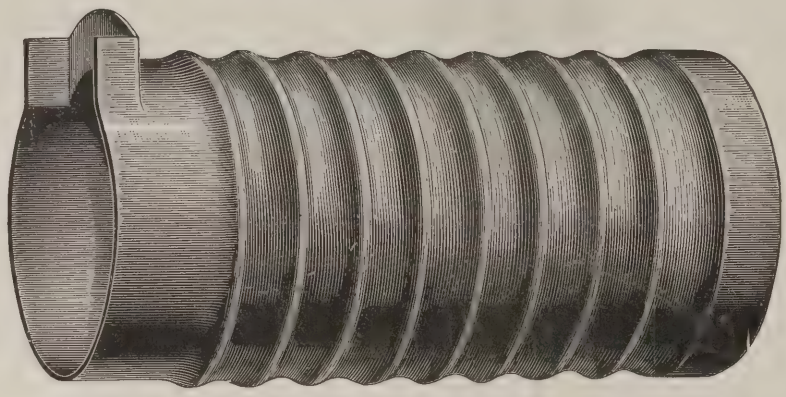

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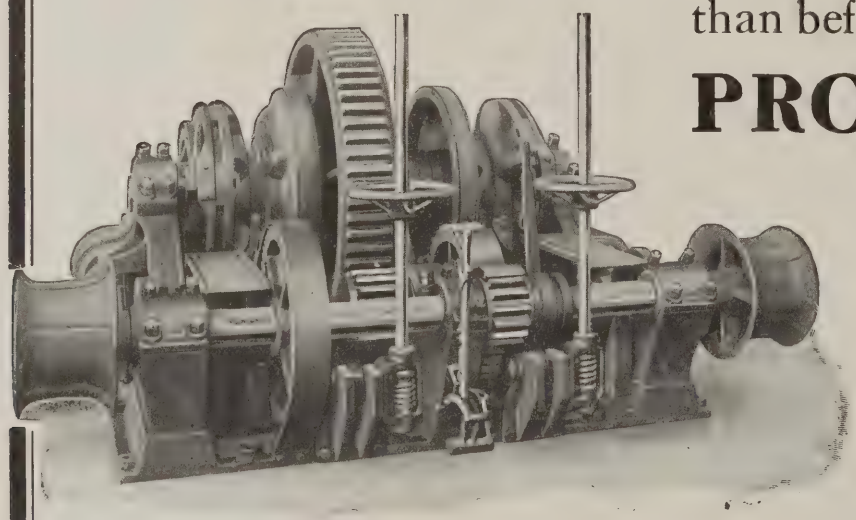

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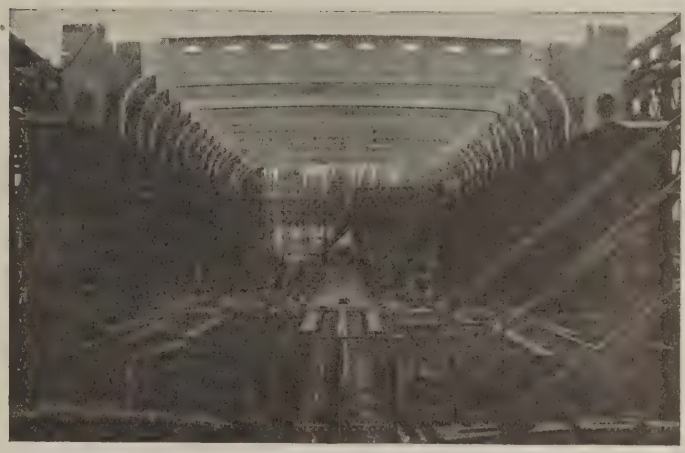

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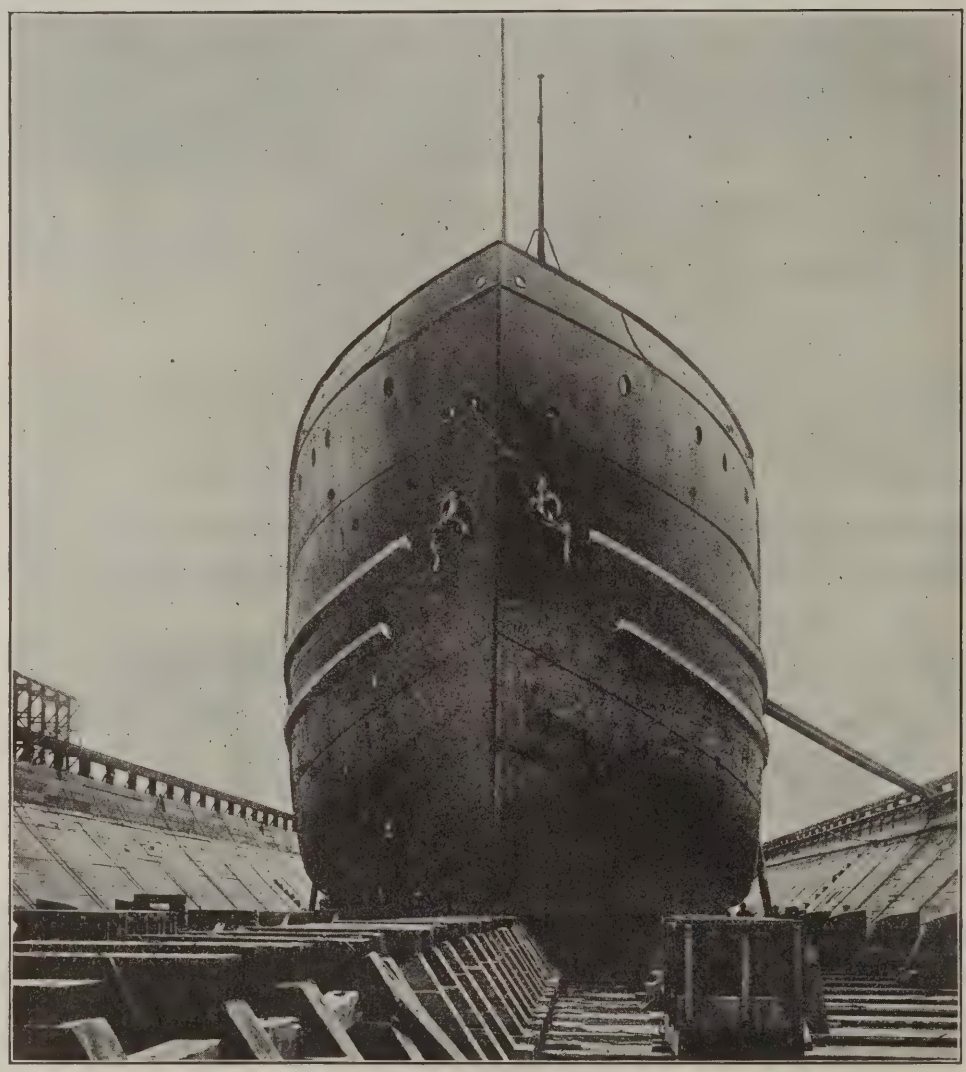

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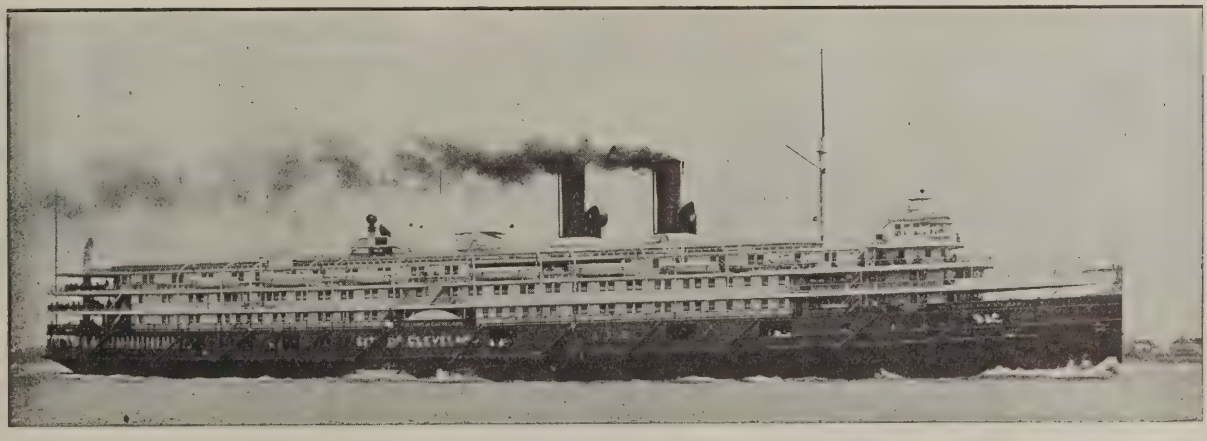

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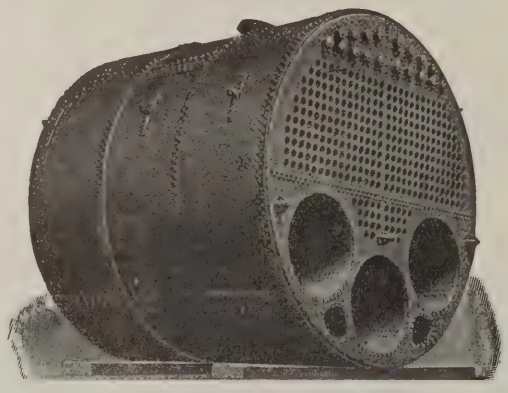

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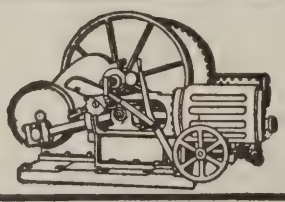

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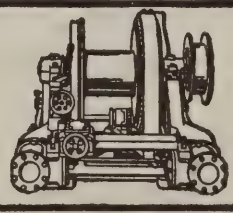

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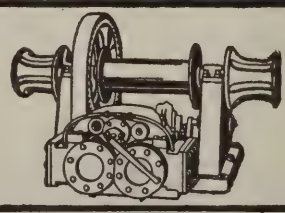

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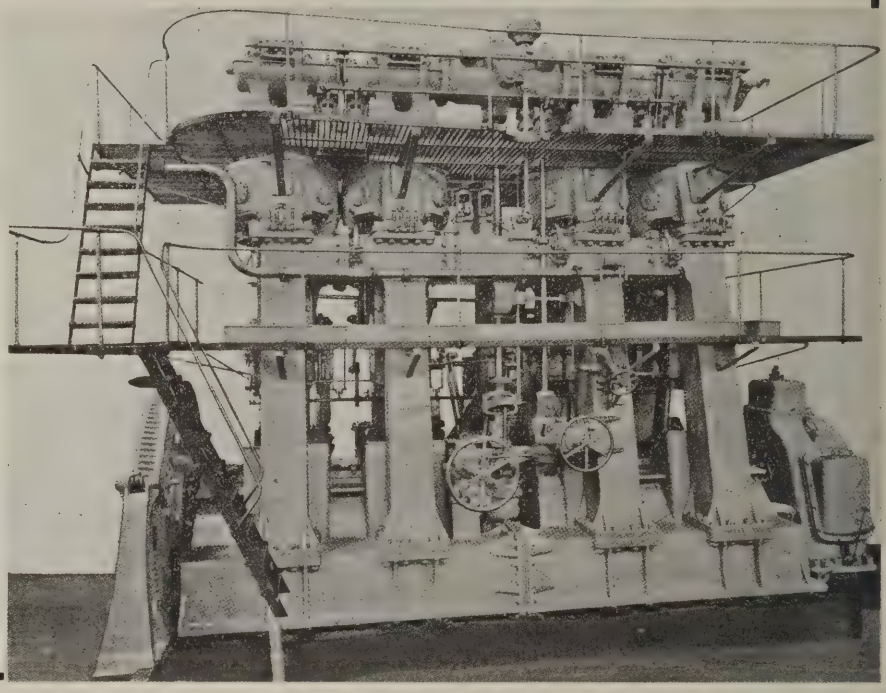

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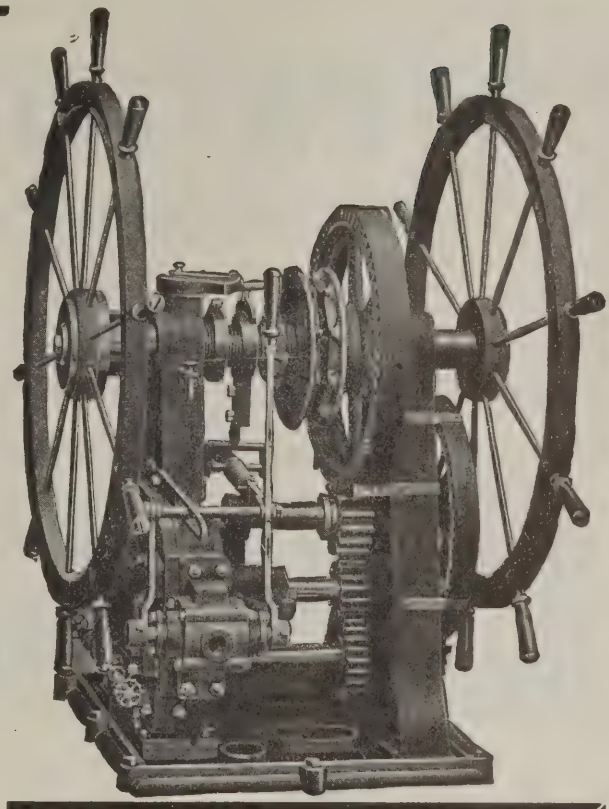

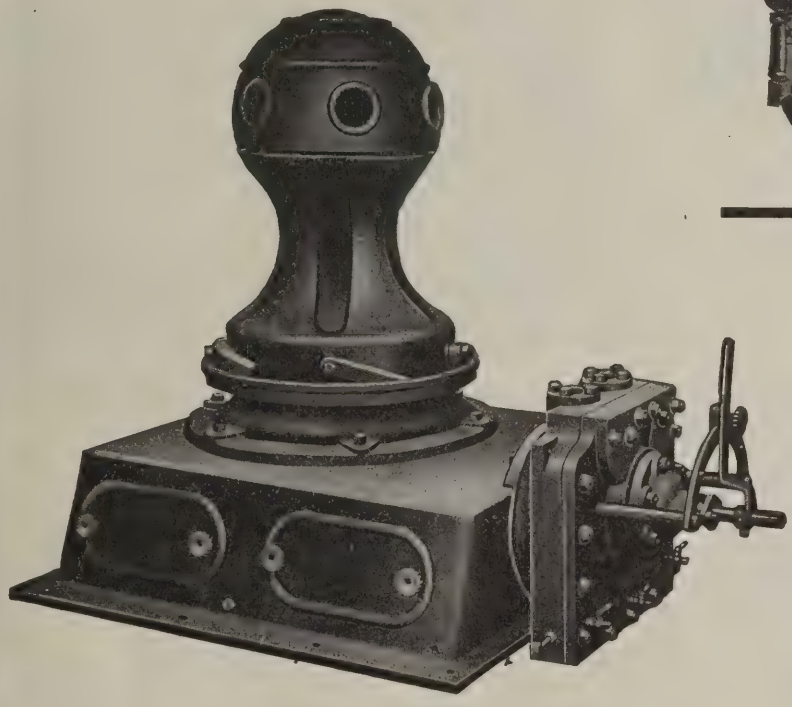

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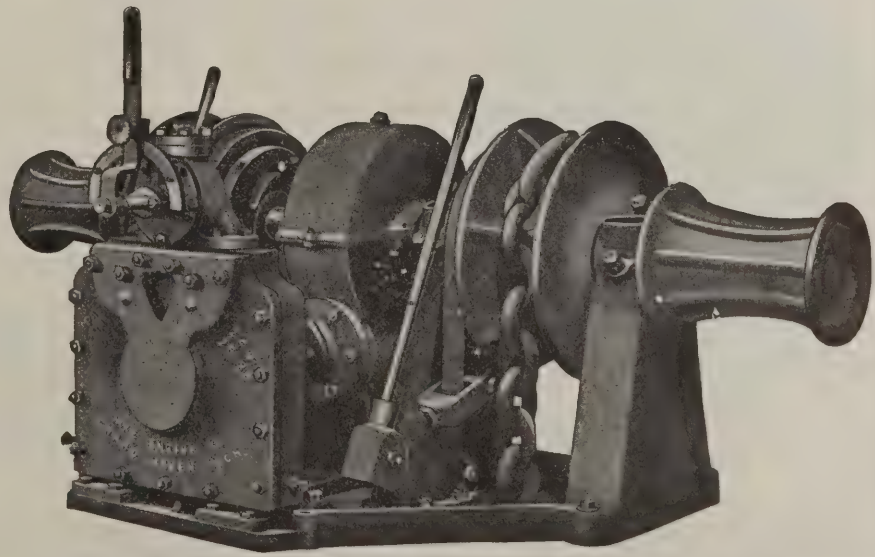

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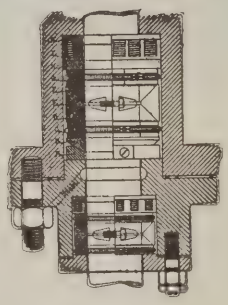

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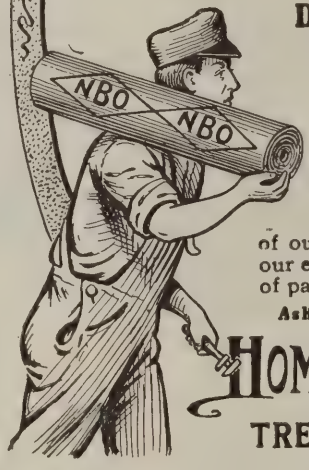

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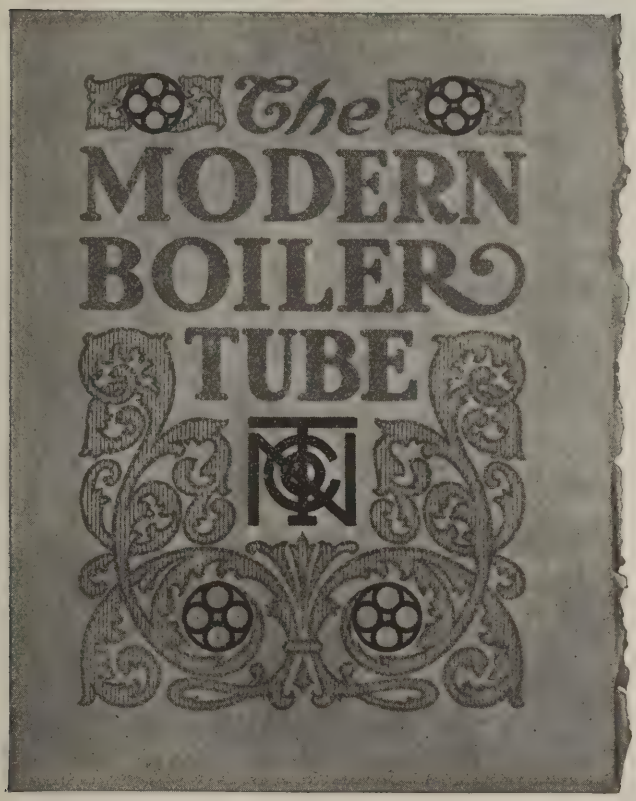

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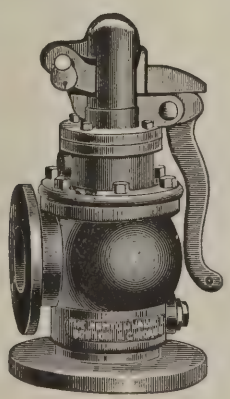

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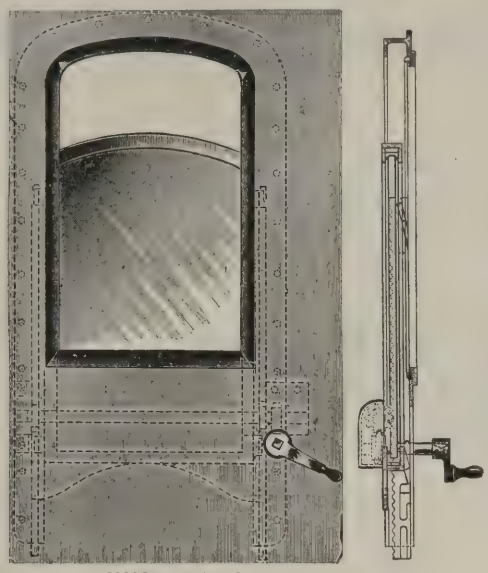

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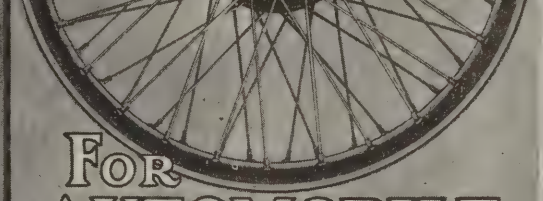

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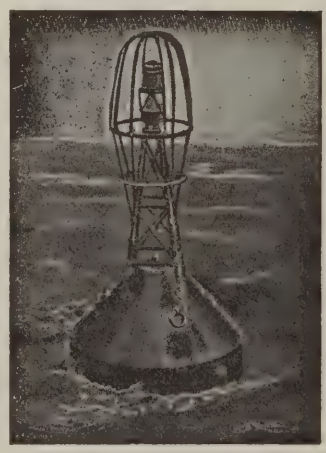

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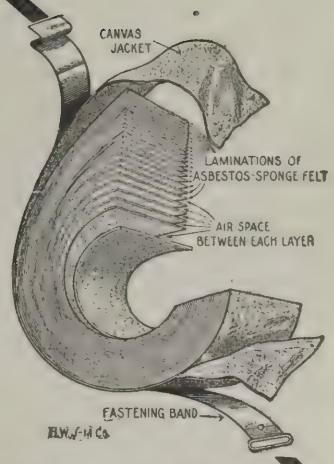

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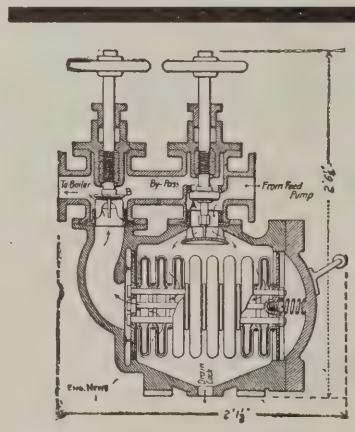

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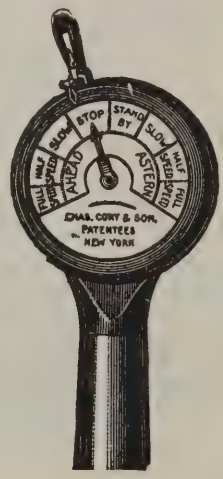

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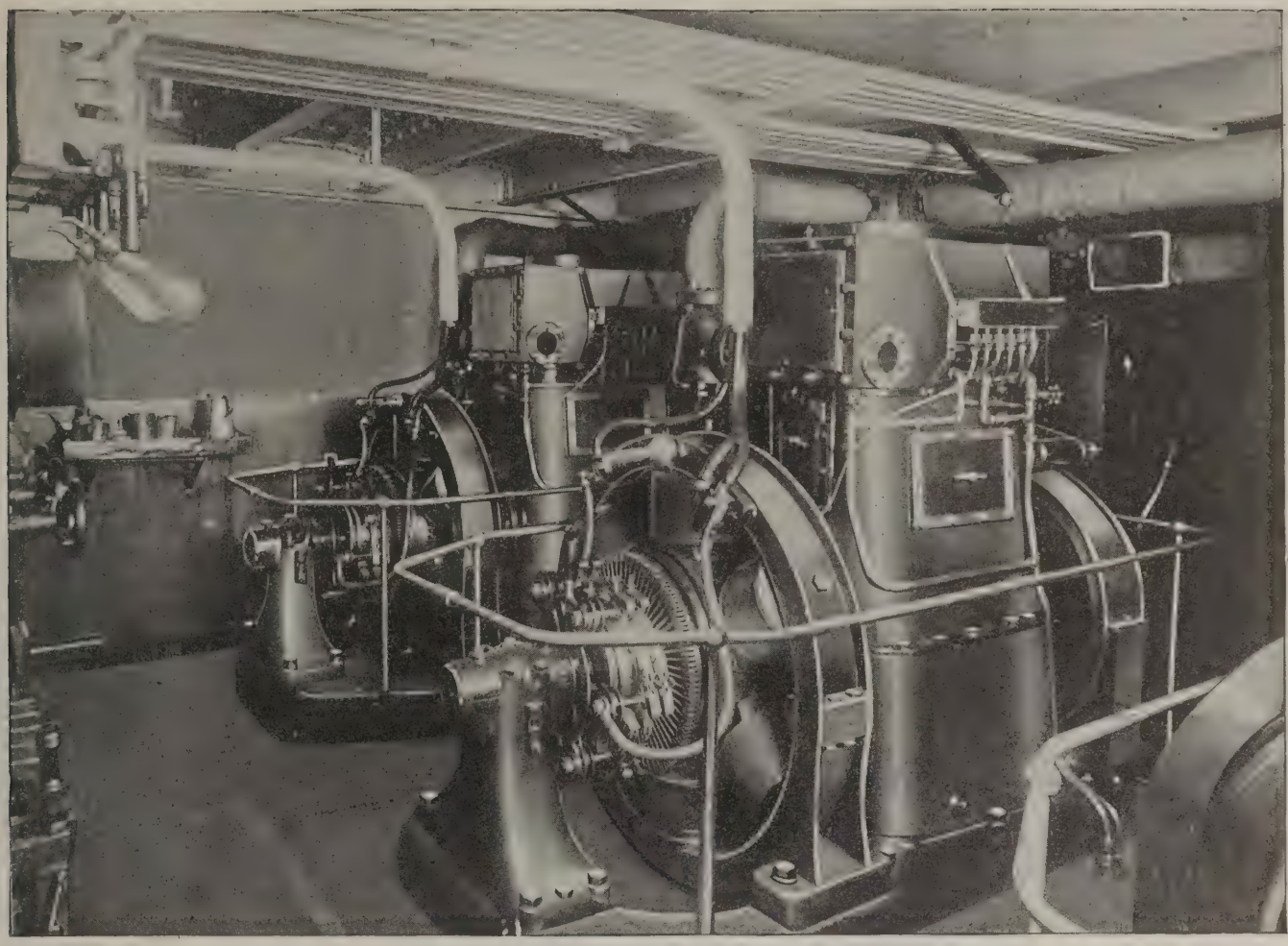

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THE MARINE REVIEW

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Cost Estimating for Jobbing Work

Describing the Organization and Procedure in the Hull Division of the Philadelphia Navy Yard

By J A Furer, Naval Constructor

THE ideal way to estimate the cost of a job is to make a time study of the operations involved, and to build up the total cost therefrom. This is a comparatively simple matter for manufacturing jobs, especially if done by piece work or under a premium system of payment, but is an impracticable method of estimating the cost of repair work for various reasons.

In the first place, no two repair jobs are exactly alike; and a very complete analysis of each job is apt to cost nearly as much as the work itself. Then, too, repair jobs must usually be done by day work, and an output of the workman under this system of compensation corresponding to the possible performance indicated by a scientific time study cannot be expected.

Ship repairs and alterations afford a particularly good example of jobbing work to which the scientific time study method of making estimates is not well adapted. Such estimates have been in the past, and still are, in a great many plants made by the foremen of the various trades. At the best, estimates made in this manner are only good guesses, based on the past experience of the foreman, as he has neither the time nor the inclination to keep extensive records of actual unit costs from which to build up accurate estimates.

By long experience, the practical man can, of course, arrive at a point where he is capable of very shrewd guessing as to the probable cost of a job; but when one hears of a foreman whose estimates made in this manner are invariably correct, it is usually reasonable to suspect that he watches the cost of the jobs closely, and that it is in his power to switch charges from those jobs on which his estimates were low to other jobs so as to come out right.

Certain it is that the establishment which depends entirely on its foremen for making estimates will lose much business, because some of its bids are too high, and will get other business resulting in loss because its bids are too low.

Although minute studies may not be practicable for jobbing work, estimates which are far superior to those ordinarily made by the supervisory force of the production department can be obtained by establishing an estimating section, and by recording actual cost data in such form that it will be readily available for building up future estimates. Industrial managers can still be found who consider the cost of a separate estimating department an unprofitable overhead expense. A very large majority of managers realize, however, that such a department more than pays its way by relieving the supervisory force of the burden of paper work involved in making estimates, and by the more reliable estimates which can be obtained therefrom.

The first thing which strikes the manager in transferring estimating work to a separate department is the paucity of data available for making estimates other than by the guessing method. The foreman, when asked for his data, will generally say that he knows about how much a mechanic and his helper can do in a day, and that he has not found it necessary to accumulate a large amount of unit cost data in order to make estimates. This statement may be quite true in the case of a shrewd foreman so far as the work of that particular foreman's trade is concerned; but as a repair job is seldom confined to one trade only, the foreman, in making his estimate, must either spend considerable time in getting estimates for the other trades from the foreman concerned, or he

FLANGED JOINTS, MAKING, 4" PIPE.

SPECIFICATION	DATE	LABOR		MATERIAL	
Based on cloth inserted rubber gasket. Marking holes & cutting gasket. Setting up bolts.	2-12-11 to 4-15-11				
Average per joint,			70		
Maximum per joint,		1	45		
Minimum per joint,			30		
Units taken from 34 joints, averaging 5.4 bolts per joint. Maximum is cost of a joint in very cramped location on ship. Minimum represents best shop conditions.					

FIG. 1

guesses at that part of the cost, usually he does the latter as being the easier.

On account of this lack of data, it is impossible to turn over the estimating to a separate department all at once. It is also usually necessary to train the personnel of this department before it can be expected to give good service, because men of the requisite experience and judgment, without further training, will not generally be found available in the establishment.

This was the situation which confronted one of the industrial divisions of a navy yard several years ago. The first step taken was to select two men as the nucleus for the estimating section personnel. It was considered especially important to make good selection to begin with in order not to discredit the work of the estimating section at its inception. The principal qualities looked for in these men were general technical knowledge of the work done by this industrial division of the navy yard, actual working knowledge of at least one trade, good judgment, and the ability to work systematically. The last mentioned quality is especially important in connection with analyzing and recording data of actual cost in such form that they will be reliable and readily available for future use. Even with these qualities, a man must be given considerable experience before he can be expected to become a reliable estimator, because the untrained man is apt not to see all of the work involved in doing a job.

The combination of these qualities can best be found in draftsmen of more or less extensive experience, who have at some time in their careers worked at a trade. Two draftsmen meeting these requirements were accordingly detailed for this work, and have proved excellent selections. With a nucleus of this character mechanics, even if they do not possess all of these qualities, can be added when the volume of the work necessitates additions to the force.

To begin with, the estimating for one shop only was taken over. The ship-fitting work was chosen for this purpose, because the foreman of this shop had in his files more complete and reliable cost data than any other foreman. It is well to begin in this manner rather than with a shop which in the past has used the guessing method, so that the estimating department may be broken in to build up estimates in the correct manner, namely, from unit costs, and will not also slip into the guessing habit.

Data files should be started at once; and such meager unit cost data as may be found in the foreman's office should be transferred to the estimating department. The below-mentioned data files are kept in the estimating section of the establishment referred to.

LINOLEUM, LAYING.

SPECIFICATION	DATE	LABOR	MATERIAL
Large job. Take up old linoleum & lay new. Per sq.ft. Data from J.O.160-D-1/642 - 7728 sq.ft. on gun deck.	4/25/11	.07	.12
Small job. Take up old and lay new. Per sq.ft. J.O.1312-D-1/641 - Commissary issuing room - 94 sq.ft. considerable waste.	5/27/11	.10	.13

FIG. 1

RUBBER, SHEET.

UNIT	SPECIFICATION	DATE	PRICE
lbs	Pure sheet rubber, 3/16"	7/26/11	1 00
"	" " " 1/4"	1/22/12	1 04

FIG. 2

Unit Operation Costs

These records are kept on 3-in. by 5-in. cards, as shown in Fig. 1. The data on these cards are compiled from analyses of jobs done in the past, elementary time studies, and data taken from the shop route sheets. If a piece work schedule is in effect, the rates should also be kept in this file. Elementary time studies are the most reliable sources of unit operation costs. A specific example will best illustrate the method of obtaining data in this manner.

DECK LIGHT, 9".

SPECIFICATION	WEIGHT
Frame, brass,	12 lbs.
Ring, "	15 oz.
8 bolts and nuts,	2 lb.5oz
Rubber grommet,	2 oz.

FIG. 3

A particular scarcity of unit operation costs of plumbing and pipe fitting work was found. The records contained, of course, an abundance of reliable data giving the total labor cost of jobs as a whole, such, for example, as the cost of installing plumbing fixtures, replacing corroded sections of piping systems on the various ships, etc. These costs were, however, valueless for making estimates (since the exact duplicate of a previous job is rarely met with in this class of work), because they did not furnish the unit cost of the many operations involved in all kinds of plumbing work, such, for example, as breaking and re-making joints on a particular size of pipe, and in a particular location on a ship.

To provide such data, therefore, a detailed record was kept every day

for several months of the exact work done by each mechanic. This record was checked daily by one of the estimators, and notation made of the surroundings and circumstanc s under which the work was done. The cost entry is always added, because revisions are constantly being made to keep step with changes in the wage schedule, improved methods of doing work and increased efficiency of the working force.

LABOR				MATERIAL			
TIME	TRADES	ESTIMATE		QUANTITY	KIND	EST. COST	
	SHOP-"K".			16-FT.	2½" IRON PIPE @ .18	2	88
	PLATFORM. 466 LBS. @ .06	27	96	50-LBS.	WROT STEEL @ .02	1	00
	SHOP-"D".			250-LBS.	10LB. PLATE @ .02	5	00
	CASTINGS FOR STANCHIONS. 35 LBS @ .10	3	50	216-LBS.	3"×3"×72" ANGLE @ .02	4	32
	SHOP-"C"				RIVETS AND BOLTS.	1	25
	CUTTING AND THREADING 4-PIECES 2½" PIPE @ .40	1	60	43-LBS.	1½" BRASS PIPE 10 FT. @ .16	6	88
				84-LBS.	1" " " 48 FT. @ .158	13	28
	BREAKING & MAKING-8-SCREWED JOINTS @ .20	1	60	35-LBS.	SCRAP BRASS CASTINGS FOR		
10-HRS.	MAKE 2 PIPE STANCHIONS @ .44	4	40		STANCHIONS @ .11	3	85
	SHOP-"G".				MISCELLANEOUS.	1	00
5-HRS.	3"×3" ANGLE FRAME @ .96	4	80		TOTAL FOR ONE SIDE	39	46
12-HRS.	FEET FOR 2-PIPE STANCHIONS @ 1.22	14	64		" " BOTH SIDES	78	92
	SHOP-"Mc"						
4-HRS.	ALTER VOICE TUBE	2	80				
12-HRS.	ALTER JACK RODS FOR WEATHER CLOTH.	8	40		INDIRECT.		
8- "	RELOCATE SIGNAL LOCKERS.	5	60	SHOP	"K" - 27.96 × .45	12	59
16- "	FIT SEMAPHORE TO NEW LOCATION & SECURE	11	20	"	"C" - 7.60 × .40	3	00
8- "	DRILL & FASTEN FEET OF TWO-2½" STANCHIONS	5	60	"	"G" - 19.44 × .85	16	53
	SHOP-"L1"			"	"Mc" - 33.60 × .50	16	80
8-HRS.	3-LABORERS TO HANDLE HEAVY WEIGHTS	6	00	"	"L1" - 6.00 × .35	2	10
	TOTAL FOR ONE SIDE	98	10		FOR ONE SIDE	51	02
	" " BOTH SIDES	196	20		" BOTH SIDES	102	04

FIG. 4—FRONT OF CARD

data were then classified and analyzed. The maximum, minimum and average costs of each unit were then entered on the cards. Unit costs were obtained in this manner for cutting and threading pipe of all sizes, making and breaking joints, both flanged and screwed, removing and re-setting plumbing fixtures and valves of all descriptions, lead lining piping of all sizes, and the other innumerable details entering into plumbing and pipe fitting work. From these unit costs even a comparatively inexperienced estimator can now build up a reasonably accurate estimate.

An elementary time study made in this manner differs chiefly from a stop watch time study in that it indicates the performance which can be expected on a future job under the existing condition of organization and management. As it is the object of the estimator to build up the anticipated cost of a job from data representing actual working conditions in the plant, time studies made in this manner are much more valuable to him than scientific stop watch time studies.

It will be noted that a column is provided on the card shown in Fig. 1 for the cost of material as well as of labor. The material column is not generally filled out, and is provided only for unit costs where a great variation in the market price of material is not likely, as a separate material cost file is kept. The date of

Unit costs as well as unit times are usually recorded, because the estimator can compile an estimate more quickly from the former than from the latter. The unit cost is merely an extension of the unit time multiplied by the rate of pay of the mechanic or gang doing the work. A brief note giving the source from

NO. 345-29 ESTIMATE DATE MAY 18 1912

SHIP BIRMINGHAM ITEM NO 10 LETTER C.O.let.4/7/12.

Build semaphore stands on after side of bridge and install semaphores on same. The semaphores are now installed on the bridge and on account of small size of bridge it is too much congested.

J. O. NO.

J. O. WORDING Build semaphore platforms at after end of bridge, port and starboard, as shown on plan 30-E-204. Re-locate signal lockers and after bridge rail to suit new conditions.

ESTIMATE	
LABOR	196.00
INDIRECT	102.00
MATERIAL	79.00
TOTAL	377.00
TIME	12 days

ESTIMATED BY | CHECKED BY | INSP. & SUPT. | MATERIAL SCHEDULE | INDEXED

FIG. 4—BACK OF CARD

which the unit was obtained, that is, the previous job, time study, or route sheet data, is entered wherever possible, as this information is very valuable in connection with the investigation of costs that do not agree with the estimates, as described further on.

Material Cost File

As the storekeeping is done by a separate department having offices in a separate building, it is inconvenient for the estimators to obtain the cost of raw material direct from the stock ledgers; and a material cost file in the estimating department, therefore, saves time. Material costs are entered on 3-in. by 5-in. cards, as shown in Fig. 2. These costs are revised monthly, if changes have occurred. When a large quantity of a certain kind of material is needed, the state of the stock in the storehouse is investigated at the time the estimate is made. If the quantity is small it is assumed that the stock on hand will suffice. If material is on hand which does not exactly meet the requirements, but which will answer the purpose, the expediency of using it instead of buying especially for this job is investigated, so as to keep the stock down to the lowest limits possible.

Stock lists of old salvage material recovered from other repair and alteration jobs are also kept on file, so that the use of such material may be specified wherever practicable. The die books showing what fittings can be obtained as drop forgings are also on file in this office.

As many estimates can best be made on the weight basis, a file has been compiled of the weight of a large number of fittings and standard material entering into ship construction. This file is especially useful for estimating the cost of castings,

shipfitters' work, etc. It is kept on 3-in. by 5-in. cards, as shown in Fig. 3.

Estimate Sheet

The form on which estimates are prepared was especially drawn up to meet the requirements of this establishment. Although the number of estimates made is very large, the size of the individual jobs is usually small. When an estimate for a very large alteration job must be made, it is always broken up into a number of estimates to correspond to the number of job orders that will eventually be issued to cover the work.

It is found that about 95 per cent of the estimates can be prepared on a 5-in. by 8-in. form. This form is shown in Fig. 4. It is printed on heavy paper, and both sides are used. Being printed on heavy paper, the size is particularly convenient, because it can be filed vertically, like a card, and need not be fastened in a folder. When an old estimate is wanted for reference, only that one estimate need be taken from the files.

The estimate is worked out in detail for labor and material on the back of the form. Pasters are added to the back in case there is insufficient room in the space available. The greater convenience of using a small, compact form rather than a larger form more than compensates for the trouble of attaching additional sheets to the small percentage of estimates which cannot be entered in the space available. The percentage of indirect expense which is to be used for each shop is furnished to the estimating section from time to time as changes are made by the accounting department, and is applied to the direct labor as shown in the figure.

The estimate is summarized on the front of the form, and the proposed job order wording is also entered, together with a brief of the correspondence which inaugurated the estimate.

Comparison of Actual With Estimated Cost

The actual cost of every completed job summarized by shops is sent to the estimating section, and is compared with the estimated cost. These comparisons serve not only the purpose of checking up the accuracy of the estimators, but frequently bring to light errors in cost keeping and inefficiency or carelessness in the shops.

A monthly report is made of the percentage variation of the estimated costs from the actual costs. This comparison is also made separately for the work of each estimator, and is a reasonably fair measure of the estimator's efficiency. This comparison also stimulates the estimator to investigate wherein he went wrong in building up the anticipated cost of the jobs. Disagreement between estimated costs and actual costs may, of course, be due to either of two causes or both combined, namely, inaccurate estimating or failure on the part of the production departments to duplicate the output indicated by the unit costs used in making the estimate.

Cases of discrepancies are first investigated by the inside superintendent to ascertain whether or not the estimate was at fault. If the estimate checks up correctly and the actual cost is low, the unit costs on which the estimate was based are examined and revised if the circumstances under which the work was done warrant such revision.

If the estimate checks up correctly and the actual cost is high, the matter is turned over to the outside or shop superintendent for investigation, together with the data of previous performances on which the estimate was based. The estimating section becomes in this way a very valuable asset to the management in locating inefficiency in the production departments, because tangible and reliable data are available on which to base investigations of excessive costs.

Index of Estimates

The estimates are carefully indexed on 3-in. by 5-in. cards, as shown in Fig. 5, so that they can be readily located in connection with making future estimates. A previous estimate on a similar job is always valuable, especially in the case of repair work, even if the jobs are not identical, because it helps to check the new estimate, and may bring to the estimator's attention some minor part of the work which might otherwise be overlooked.

PLATFORMS, SEMAPHORE.

SUBJECT	SHIP	No.
Changing location, BIRMINGHAM.	345	29

FIG. 5

Diesel Ship for South American Service

The Howaldswerke, Kiel, has recently completed for the Hamburg-South American Steamship Co., Hamburg, the trans-Atlantic twin-screw cargo-boat Monte Penedo, which is propelled by two-cycle crude oil engines. Her principal dimensions are: Length, 350 ft.; breadth, 50 ft.; depth, 27 ft. Her gross registered tonnage is about 4,000 tons; she has a carrying capacity for 6,500 tons, and her speed fully loaded is about 10½ knots. The propelling machinery consists of two reversible, 4-cylinder, 2-cycle Diesel-Sulzer crude oil engines of together about 2,000 I. H. P. The auxiliary machinery includes a 50 H. P. Diesel engine-driven dynamo; an air compressor driven by a similar engine; an accessory steam-driven air compressor; a condensing and water cooling plant. The auxiliary machinery is steam-driven with the exception of the steering gear, which in the open sea is operated by heated compressed air; the necessary steam is raised in an oil fired boiler.

SEMAPHORE PLATFORMS.

SUBJECT	SHIP	No.
Changing location, BIRMINGHAM.	345	29

FIG. 5

The steamer Dakotan, building for the American-Hawaiian Steamship Co. at the Maryland Steel Co.'s yard, Sparrows Point, Md., was launched last month. The Dakotan has a length over all of 429 ft., beam 53½ ft. and depth 29½ ft., and is the second of eight freighters contracted for by this company to be launched.

Trials of Battleship Wyoming

She Has Established Herself as the Fastest Super-Dreadnaught Type in the Navy

THE battleship Wyoming, built by Cramps, Philadelphia, has established herself as the fastest of the super-dreadnought type in the United States navy. She underwent her trials during the latter part of July.

Leaving League island navy yard at 11:00 a. m., Monday, July 15, she steamed down the river to Deep Water point and anchored at 2:20 p. m., left Deep Water point 10:25 the following morning and proceeded to the Delaware bay, where compasses were adjusted and main engines slightly toned-up and everything put in readiness for a series of unofficial speed runs en route to the trial course off Rockland, Me. Arriving at Rockland Thursday at 7:45 p. m., work was commenced on the final adjustments of turbine rotors, consisting of increasing and decreasing the various dummy clearances as necessary for the efficient and economical operation of the installation and design.

BATTLESHIP WYOMING

Upon the completion of the above, the specified standardization runs over the measured mile course were started, making three runs each, at 10, 12, 15, 17.5, and 20.5 knots; and then five runs at her highest speed, making a total of twenty-three runs. These runs were completed Friday, July 19, with considerable wind blowing.

The curve constructed from these runs showed that to maintain the required speed as specified in the contract for 20.5 knots per hour, that 280.2 revolutions per minute would be required. On one of the highest speed runs, the maximum number of revolutions per minute made by the propellers were 333.61, which by far exceeded the contract requirements.

Until the Wyoming made her highest speed runs her sister ship, the Arkansas, built at Camden, N. J., held what was considered a world's record for this type of warship, her record being 21.153 knots, while that of the Wyoming for her average of the highest speed runs was 21.323 knots.

Saturday the four-hour full power trial was started, during which the Wyoming on the second hour of this trial developed the remarkable speed of 22.045 knots, which is declared by naval experts who were aboard to be the fastest time ever made by any battleship or dreadnought in the world of such tonnage and carrying twelve 12-in. guns in her main battery. The average speed for the four-hour full power trial was 21.21 knots.

Particulars of the Wyoming

Finishing this run fires were cleaned, ashes put overboard, and ship reweighted at sea, and brought down to the trial displacement and the 24-hour, 19-knot speed, coal and water consumption trial was started. Following this the ship was again reweighted, etc., and the 24-hour, 12-knot speed, coal and water consumption test was started and finished 2 p. m., Monday, July 22, when the severe backing tests and the tactical steam steering diameters of the ship were taken.

The two-hour trial of fuel oil and coal combination terminated the government tests, when the Wyoming started for the Delaware Capes. The following are the general dimensions of the Arkansas and the Wyoming:

	Ft.	In.
Length over all	562	
Length between perpendiculars	554	
Length on load water line	554	
Extreme beam (beyond armor)	93	2⅜
Beam on load water line	92	10¼
Designed draught (mean)	28	6
Displacement at designed draught, tons	26,000	
Load water line displacement per inch, tons	88.4	

The hull was designed by the bureau of construction and repair of the navy department, on lines similar to those of the Florida and Utah, with high freeboard forward which insures better seaworthy qualities than the previous types of dreadnoughts built by foreign nations. Steam is furnished by twelve Babcock & Wilcox water tube boilers. The boilers are designed to be combination coal and oil burning, and contain the necessary triple balance between oil, coal and air supply. The satisfactory results obtained from the two hour trial clearly demonstrated the possibilities to be derived from the adoption of oil, as the exclusive fuel for battleships. Ships fitted for burning oil alone, will have to have the furnace volumes greatly increased should the same system of air admission remain.

The saving in fireroom weights and the decrease in the length of the space required for the boilers are predominating factors, which greatly favor the exclusive use of oil for the fuel of battleships.

The capacity of the boilers of the Wyoming are such that all steam machinery can be run at full power with an average air pressure in the ash-pits of not more than 2 inches of water. All the pressure parts of the boiler are made of open-hearth steel plate, the tubes of cold drawn seamless steel with no screw joints exposed to the fire. They are fitted in groups of four, in watertight compartments. Two smoke pipes take the waste gases of combustion, each with an area of 104 sq. ft., and

are 91 ft. above the grates.

The general boiler dimensions are as follows:

	Ft.	In.
External height	13	10 3/16
External length	12	3 3/4
External width	20	3/4
Number of furnaces in each boiler.	1	
Number of headers in each boiler..	31	
Grate surface, square feet	119	
Heating surface, square feet	5352.83	
Ratio of grate to heating surface	1:44.98	
Length of grates, feet	7	
Width of grates, feet	17	
Per cent of air space in grates	49	
Designed working pressure	210	
Boiler test pressure	315	

Each boiler has the following tubes:

Number	1,100	31	2	31
Thickness, B. W. G..	8	6	6	6
Outside diameter	2	4	4	4
Length as fitted, inches	98	98	95 1/4	76

The Peabody burner was used in the oil burning trial, along with the closed fire room system of forced draft, all blowers being driven by electric motors; twelve in all, limited to 1,200 R. P. M.

Machinery Particulars

The main engines consist of Parsons marine steam turbines, eight in number arranged on four shafts. The cruising turbines are fitted on the inboard shafts along with the low pressure ahead and low pressure astern. This astern turbine is incorporated in the same casing as the low pressure ahead turbine. On the outboard shafts are fitted the high pressure ahead and astern turbines, entirely separate. With this arrangement for speeds up to about 15 knots, steam is admitted into the high pressure cruising turbine, and after finishing work in this engine exhausts into the steam supply of the intermediate cruising turbine, from thence to the high pressure ahead turbines on the outboard shafts and finally to, and through the low pressure ahead turbines on the inboard shafts to the main condensers.

The following are the turbine cylinder and rotor dimensions:

	Diameter of cylinder. In.	Diameter of rotor. In.
H. P. cruising	74 1/2	73
I. P. cruising	74 3/4	72
M. H. P.	76 1/4	74
Ahead L. P.	111 1/2	101

	Number of expansions.	Number of rows.
H. P. C.	3	60
I. P. C.	3	54
M. H. P.	6	78
A. L. P.	6	39
Longest length of blading		13 1/2 in.
Shortest length of blading		3/4 in.

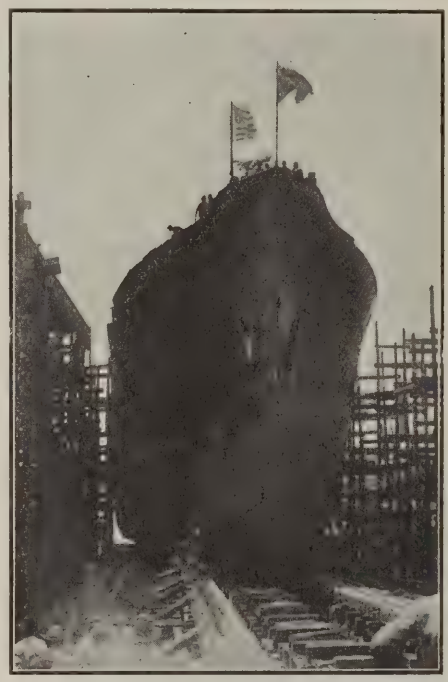
The designed I. H. P. was 28,000 for a speed of 20.5 knots per hour, and during her trials as much as 33,000 S. H. P. was recorded by the torsionmeters.

The New Orleans Steamship Co., New Orleans, La., has been organized with the following officers: S. D. DeMilt, president; A. R. Lafonta, vice president; Frank A. Daniels, secretary-treasurer.

Clyde Liner Lenape

The steamship Lenape, now under construction at the Newport News Ship Building & Dry Dock Co.'s yard, at Newport News, Va., was launched on Aug. 17 and will go into the service of the Clyde line before the close of this year. Miss Margaret Stone, of Marion, Mass., daughter of Galen L. Stone, one of the owners and directors of the Clyde Steamship Co., was sponsor.

The Lenape, like all the Clyde line ships, is an Indian name, and



THE LENAPE LEAVING THE STOCKS

comes from the Indian tribe which inhabited the country surrounding the Delaware water gap.

The Lenape marks an era in point of size and speed and accommodations, in coastwise service. She will have dimensions of an even 400 ft. in length, 50 ft. beam and a depth of 30 ft. The vessel has been built under the American bureau of shipping classification and will be Class A-1, and is of steel construction throughout with freight carrying capacity of about 5,000 tons and a displacement of 7,000 tons; speed 14 knots. She will have three passenger decks. Appointments for passengers and interior finish will be of the best and finest in American coastwise ships.

The Lenape will be the largest of the Clyde line fleet, and in addition to this she differs in some respects from the other ships, being bridge enclosed amidships for the first passenger deck, above which will be a continuous promenade deck.

The propelling machinery consists of four Scotch boilers, fitted with heated forced draft, one triple expansion engine of about 4,000 horsepower, together with all auxiliaries and in addition, a refrigerating machine for steward's cold storage. There will be accommodations for about 350 passengers, consisting of first class and steerage. She will have ample boat and life-saving equipment, with boat capacity for all the passengers and crew.

In efficiency, the Lenape will rank among the finest vessels in the coastwise trade and also as regards appointments.

The construction of this ship is under the supervision of Theodore E. Ferris, naval architect and engineer, of New York, who also prepared the designs, plans and specifications in collaboration with H. H. Raymond, vice president and general manager of the Clyde line, C. D. Selden, for many years consulting engineer of the line, W. T. Webster, superintending engineer, Capt. C. D. Rockwell, marine superintendent, G. T. Edgcumbe, and D. D. Hargan, of the Clyde Steamship Co.

Collingwood Ship Building Co.

The Collingwood Shipbuilding Co., Ltd., at Collingwood, Can., is one of the busiest of lake shipyards. At present they have two large steel steamers for lake trade and one steel steamer for ocean trade, and two enormous steel dredgers, for the Canadian government of ocean-going type, fitted with elevator bucket dredging plant for digging in 52 ft. of water, for present service on the lower St. Lawrence ship channel. Besides this they have numerous smaller contracts on hand, as well as a large amount of job work and dry dock repairs, which is going on continually. They are at present employing about 800 men at the Collingwood yard.

They are associated with the Kingston Shipbuilding Co., Ltd., of Kingston, Can., where they built up about two years ago a modern steel shipbuilding and repair plant for carrying on new work as well as dry dock repairs. They are at present building two large lighthouse and buoy steamers for the Canadian government, and are employing about 300 men on the hulls and superstructure and general equipment of the ships. The engines, boilers and cabin interior finish are being built by the Collingwood Shipbuilding Co., at Collingwood.

New Type of Centrifugal Pump

Description of the Roturbo Design Which the Manistee Iron Works Co. Will Manufacture

THE modern and successful development of rotary machinery of the form of electric motors and steam turbines has reacted on the centrifugal pump and created a demand for a design to meet all pumping problems and the highest efficiency, so avoiding gearing and reducing cost, weight and expense. Hitherto centrifugal pumps have fallen short of the general requirements of many problems due to their tendency to wear and consequently loss of efficiency when dealing with gritty water, also because of the lack of self-regulation or automatic adjustment to varying heads. Self-regulation when attempted, should be secured with the highest average efficiency over a wide range of duty.

Until about ten years ago it was generally agreed that centrifugal pumps were only suitable for low lifts and large volumes of water, such as occur in irrigation, sewage, salvage work and for circulating water for condensers.

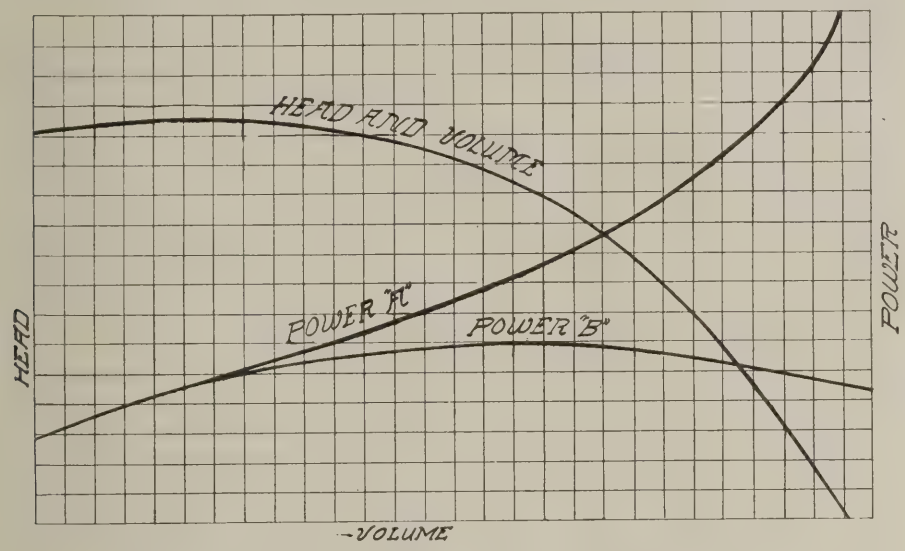


FIG. 1—COMPARISON OF POWER CURVES. A—ORDINARY TURBINE CENTRIFUGAL PUMP; B—REES ROTURBO CENTRIFUGAL PUMP

The efforts of early designers that the centrifugal type should not be limited to a few of the pumping problems of the world is shown by the patents taken out in the attempt to overcome the well known difficulties, and to make the centrifugal pump suitable for high lifts by using a number of impellers in series.

No doubt the delayed development was largely due to the fact that to get the best results from a centrifugal pump, impellers should be of small diameter running at high speed, rather than of large diameters running at low speed, but until the advent of the electric motor and steam turbine there was no means of driving centrifugal pumps at the necessary speed except through belting or gearing with their inseparable difficulties and losses in transmission, which neutralized the advantages aimed at in the pumps.

With the introduction of electric motors and steam turbines high efficiencies became possible and for high lifts the old arrangement of impellers in series was revised and the centrifugal pump became a strong competitor of the plunger pump for conditions which used to be looked upon as only suitable for reciprocating pumps.

Perhaps the defect which has been the most difficult to overcome and which has decided the buyer in many cases against this type of pump, has been the fact that it would only work at its best at the exact head for which it was designed, the reason of this being that the blades of the impeller were shaped so as to pass a certain amount of water with the minimum

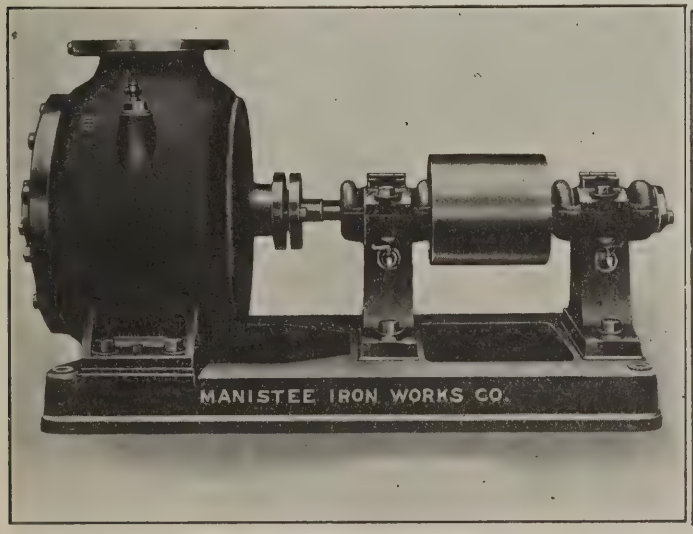


FIG. 2—STOCK OF ROTURBO PUMP

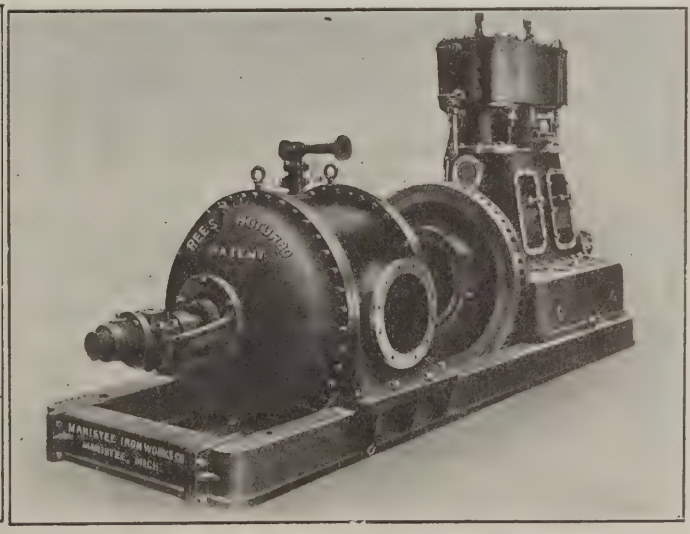


FIG. 3—STEAM-DRIVEN ROTURBO PUMP OF 400,000 GALLONS CAPACITY PER HOUR

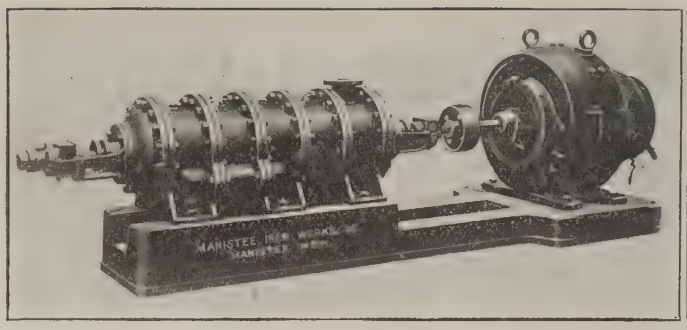


FIG. 4—LATEST TYPE OF REES ROTURBO BOILER FEED PUMP

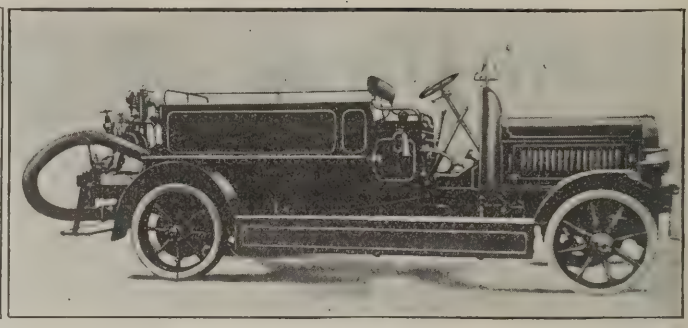


FIG. 8—APPLICATION OF ROTURBO PUMP TO FIRE ENGINE

friction of loss, due to cavitation; but if the head against which the centrifugal pump is working is reduced, a greatly increased volume of water passes and the impeller then becomes unsuitable for the increased speed of the water through it and begins to act as a water brake, thus creating an overload on the driving machine. Large numbers of motor-driven centrifugal pumps have given trouble or been burnt out by reason of this inherent defect if they have not had a large margin of power.

Since the variation of head either in the suction or delivery is one of the commonest conditions met with in pumping problems it has been a large handicap to the wider introduction of centrifugal pumps.

These conditions were well known and it was attempted to overcome them by designing the impeller with blades bent rearwards so as to reduce the brake effect. This necessitates increase in the speed of the impeller to compensate for the slip of the water and beyond a certain amount of re-curvature the capacity of the pump is very greatly reduced and the internal friction of the impeller increased with consequent loss of head at anything but a restricted range of service.

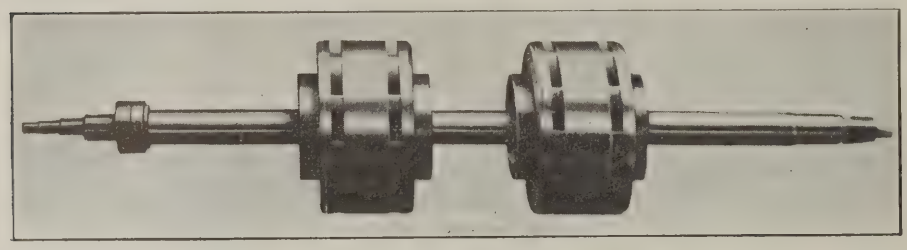


FIG. 5—PRESSURE CHAMBERS

The problem of varying heads has been completely solved by the invention known as the Rees pressure-chamber impeller which was placed on the market in Europe in 1907 by the Rees Roturbo Manufacturing Co., of Wolverhampton, England. The invention has been protected by patents in every country in the world by the parent company, the Rees Roturbo Development Syndicate, Ltd., Wolverhampton, England. Pumps are being sold under license in most of the European countries, among these may be mentioned Krupp, of Essen, Germany.

Since introducing this new type of pump many installations for all kinds of services have been installed abroad and in many instances where no other type of centrifugal pump could be used, these have given excellent service and satisfaction to the users.

The pump illustrated herewith constitutes an entirely new departure, the name "Roturbo" has been registered to denote the type.

The sole rights to manufacture and sell Roturbo pumps in this country and Canada has recently been obtained from the Rees Roturbo Development Syndicate, Ltd., by the Manistee Iron Works Co., of Manistee, Mich. This firm has been in business since 1871 as manufacturing engineers, and in 1907 they greatly extended their plant and improved their facilities so that their factory represents today one of the most modern and well equipped in the country capable of turning out a very large quantity of high class work for all classes of pumping machinery, including rotary air pumps and ejection condensers, etc.

The characteristic feature of this pump is, that it is a true turbine pump, that is to say, the "rotor" has a strong "turbine" effect, due to the water passing, hence the name—Roturbo. The turbine effect is secured by making the rotor of large capacity for storing water which is maintained by rotation at a constant maximum internal pressure with the minimum amount of loss, consequently, instead of throwing away the surplus speed energy of the water discharged when the head of delivery is reduced, the energy is extracted from the water before it leaves the pump casing.

Pumps of the Roturbo design present such marked characteristic differences in their operation and action compared with known types, as in effect to constitute them a new class.

In a pump constructed as described above, it is found that the power absorbed when running at a constant speed remains practically constant for all heads of discharge and heights of suction possible and never appreciably exceeds that required for the total head for which the pump is designed. Thus, such a pump is self-regulating, it being impossible by any variation of head suction to throw any excessive load or strain on the driving motor. There are no moving on parts in contact except at the bearings. The internal arrangements are such that the whole pump is in hydraulic balance and without end or lateral pressure on the shaft.

In the characteristic curve of the Roturbo pump it will be noticed that the power rises to a maximum at about normal head and volume, but the head can be reduced to any extent without affecting the power curve, and the discharge can be reduced below the atmospheric line, into vacuum, without any effect except reducing the power required for the motor.

If we now superpose a Roturbo characteristic curve on that of an ordinary volute centrifugal pump, when drawn to the same scale, Fig. 1, the vertical distance between the two power curves will represent the turbine effect extracted in this Roturbo from the water at any head and volume.

This curve marks the advance made and enables the Roturbo to be used under circumstances, which could right-

ly have been considered impossible on a centrifugal pump before the advent of this new type.

In the Roturbo pump the design differs from the ordinary impeller or flat disc runner, which is formed with the main object of securing velocity of the water in the expanding channels of the fixed casing.

With the Roturbo pressure-chamber, the water, after being picked up at the eye, becomes practically stationary, relatively to the pressure-chamber itself, thus eliminating friction losses, and generating a pressure by centrifugal force.

The inner portion of the impeller between the eye and the largest section of the pressure-chamber may be looked upon as a centrifugal pump proper and the blades of this portion are designed similarly to those of an ordinary centrifugal pump. The rim portion, beyond the pressure-chamber, is designed as a reaction turbine, having rearwardly directed nozzles, discharging from the pressure chamber.

The pump is, therefore, always discharging with a constant pressure, which is the ideal condition for a centrifugal pump, and the turbine is always discharging from a constant pressure, which is the ideal conditon for a turbine. The result of a combination of a pump and turbine, with a pressure-chamber between them, is that the self-regulation is perfect, and at any heads lower than normal duty the power taken from the motor is prevented from rising. As the speed of the water in passing through the pressure-chamber is reduced, internal friction is reduced to a minimum and a high efficiency is secured without the necessity of machining or polishing blades or surfaces. The internal wear is also minimized.

In practice it is found with this type of pump that the highest efficiency point is at a duty in which the speed of the water issuing from the turbine blades is about half the periphery speed of the impeller. Consequently, the resulting speed in relation to the fixed casing is greatly reduced; as a result of this the diffusers may be removed some considerable distance from the periphery of the impeller, and there is nothing in the path of the water after leaving the impeller and the speed of the water being also low, it has been shown from all results that there is no tendency to wear at this point, even when pumping gritty water. This forms a marked contrast to the usual centrifugal pumps, whose facilities have to be provided for the renewal of blade tips and other parts, due to the excessive erosion. With much wear, of course the pump efficiency falls rapidly.

The illustrations show examples of these pumps for wide range of duties with their respective curves showing the actual power absorbed and the efficiency, and it is worthy of note that the efficiencies procured from Roturbo pumps are permanent efficiencies as the results depend much less upon diffusers effect in the casing than on the ordinary turbine pump, which is liable to considerable loss of efficiency when wear takes place. This is well illustrated in the efficiency procured from the Roturbo irrigation type of pump, which is especially designed for large volumes and medium and low heads such as are required in irrigation, sewage, and circulation pumps for condensers.

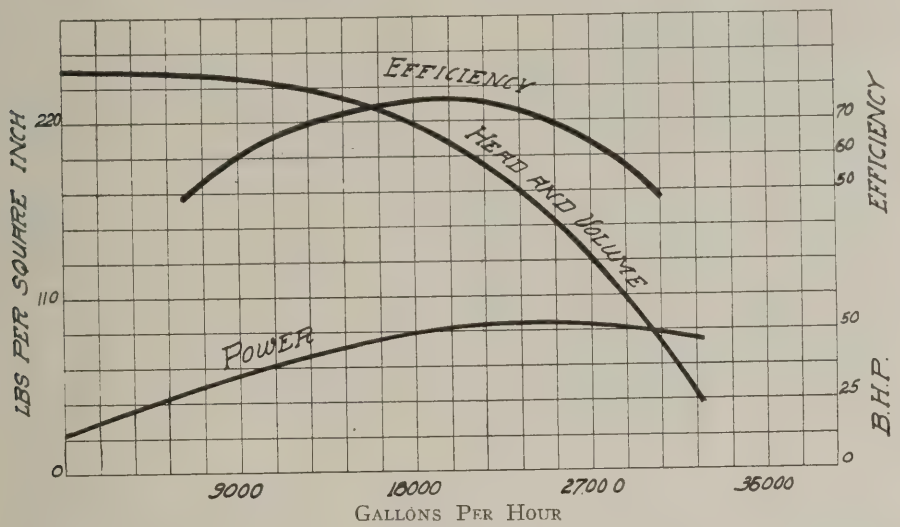


FIG. 6—REES ROTURBO PUMP. NORMAL DUTY, 220 LBS. HEAD, 18,000 GALLONS PER HOUR

In this type of Roturbo, Fig. 2, all the diffusers in the fixed casings are eliminated so that any suspended matter which passes through the pressure-chamber of the impeller has a clear flow through the fixed casing. The style which is a stock type meets all usual requirements for low heads, although embodying the simplest parts and construction, require no special care in machining, so forming a cheap type of pump. Owing to the low velocity of water through the pressure-chamber of the impeller, the efficiency is very much higher than the ordinary volute pump in this class, and this is secured without the use of diffusers. The efficiency is not only high but permanent.

Fig. 3 shows a steam-driven Roturbo pump, of 400,000 gallons capacity per hour that was installed in Nova Scotia, and was driven by a direct-connected steam engine of 300 B. H. P., running at 400 revolutions per minute. The pump delivered water against a head of 150 ft. The test at the works gave an efficiency of 84 per cent at the duty point.

Fig. 4 represents the latest type of the Rees Roturbo boiler feed pump, direct coupled to an enclosed ventilated, direct current motor. The pump impeller consists of a series of pressure-

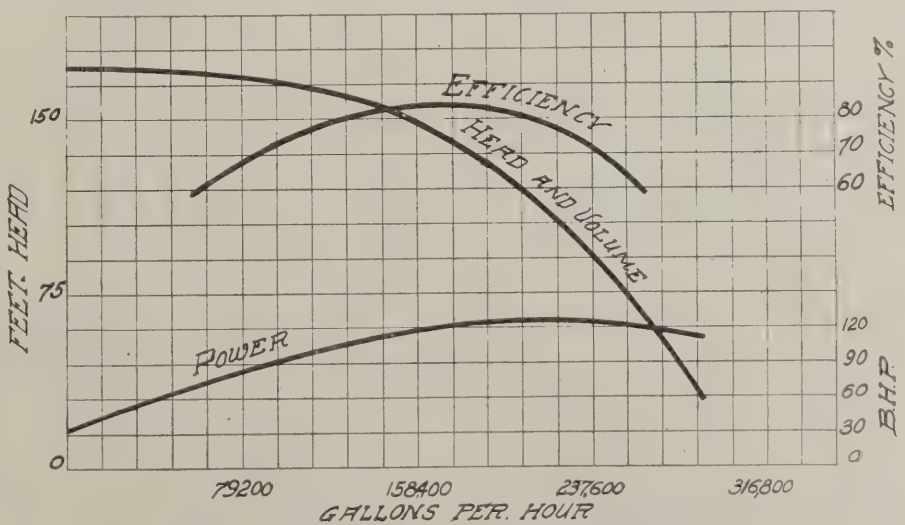
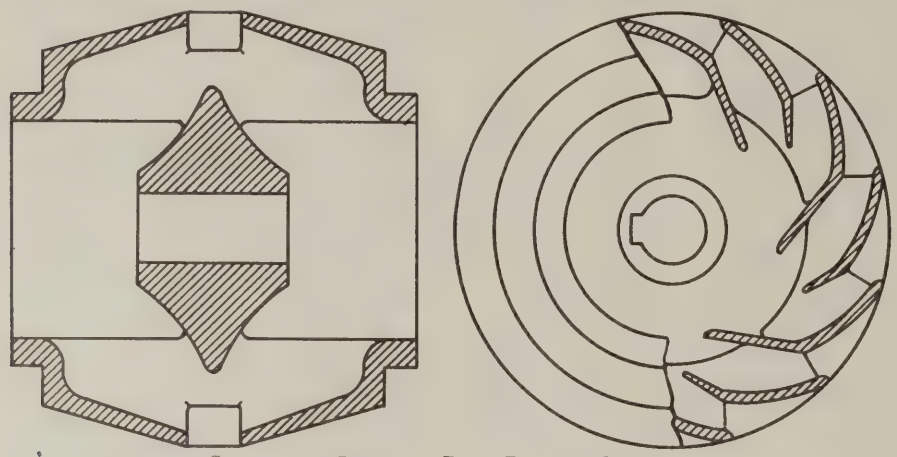


FIG. 7—REES ROTURBO PUMP. NORMAL DUTY, 150 FT. HEAD, 158,400 GALLONS PER HOUR

chambers which are mounted upon a central shaft supported upon bearings throughout the whole length except that portion passing through the chambers. The general appearance of these pressure-chambers is shown in Fig. 5. The whole pump is in perfect hydraulic balance. This feed pump on test, delivered 18,000 gallons per hour against a boiler pressure of 220 lbs. per sq. in., and took 50 B. H. P. to drive same, showing a pump efficiency of 76.5 per cent.



SECTION OF IMPELLER REES ROTURBO PUMP

Fig. 6 shows the characteristic curve and efficiency for the above.

An interesting example of a comparatively low speed Roturbo pump running at 925 revolutions per minute gave the high efficiency of 84 per cent. The duty of this pump is 150 ft. lift and a delivery of 158,400 gallons per hour at the above speed, the diameter of the discharge pipe being 12 in.

The curve shown in Fig. 7 gives the performance of the pump under test to meet stringent contract conditions. The overall efficiency of the pump and motor was shown to be 75 per cent.

When this pump was tested at the works the following results were procured: Starting from the duty point, viz., 158,400 gallons at 150 ft. head, the power is reduced from 120 H. P., to less than 40 H. P., as the discharge valve is closed. To the right of the curve when the discharge valve is opened so as to reduce the head against which the pump is working, the volume with minimum pressure is increased to double of that at the duty, showing that there is no throttling in the pump and no reduction of capacity.

The characteristic of the pump is shown in the power curve which, instead of rising at the lower heads, is actually reduced from 135 H. P. to 105 H. P., due to the turbine effect of the impeller.

Therefore, the Roturbo type of pump giving self regulation and high and permanent efficiency at constant speed coupled with the modern speed prime movers in shape of electric motors, steam turbines, gasoline engines, etc., finally removes the limitations of the centrifugal pumps entirely and the above illustration shows that there are few conditions of pumping that the Roturbo type of pump is not fitted for.

The Roturbo pumps are operated for pumping sewage, mines, coal mines, boiler feeds, pressure augmentors for city service, fire protection, dock pumping, cooling towers and condensing plants, etc.

They are also being used with exceptional advantage for fire-engine service. Fig. 8 shows an application of the Rees Roturbo pump for this service driven by a gasoline engine.

This machine is equipped with a 50-H. P. engine adapted to drive either the machine or the pump as required. The outfit attains a speed of 40 miles per hour when running on good roads. The efficiency obtained at the pump, viz., B. H. P. to W. H. P., was 74 per cent when working at the duty and against a pressure of 120 lbs. per sq. in.

Due to the self-regulating characteristics of this pump the streams can be delivered through any number of hose-pipes without overloading the engine when the head is reduced. Consequently, the maximum power of the engine can be utilized at all times, no matter what the head may be, since it runs at constant speed.

Operating Ships Without License

The steamboat inspection service has issued the following circular to owners, agents and licensed officers of vessels which is self explanatory. The circular is unequivocal in tone and apparently the service has become exasperated over the frequent repetition of a condition for which there rarely or never is any real excuse:

Section 4438, Revised Statutes, provides that—

It shall be unlawful to employ any person or for any person to serve as master, chief mate, engineer or pilot of any steamer or as master of any sail vessel of over 700 gross tons or of any other vessel of over 100 gross tons carrying passengers for hire who is not licensed by the inspectors; and anyone violating this section shall be liable to a penalty of $100 for each offense.

Violations of this character are becoming more frequent; and, in the appeals to the department for the mitigation or remission of penalties which have been imposed, the licensed officers offer as an excuse or explanation that they did not know that their licenses had expired, or that they had forgotten to have the license renewed, or that they were mistaken as to the date of expiration, etc.

Owners offer the excuse that they have no knowledge of the life of the license, or that as long as they are assured that the officer has a valid license when they engage him their responsibility ends, or that they can not be expected to know when a license expires, etc.

There is no reason why an officer should not renew his license upon its expiration and why owners should not be kept informed of the status of their officers, as every license issued states on its face the character of the license and that it is issued for a "term of five years" from a date given on the license, and the department takes this occasion to notify all persons interested that hereafter no leniency may be expected and no mitigation or remission of penalties respecting violations of section 4438, Revised Statutes, will be considered, except that it can be satisfactorily explained that such violations are not the result of indifference or neglect on the part of either owners or officers.

BENJ. S. CABLE,
Acting Secretary.

The United States engineer, Portland, Ore., is advertising for sealed proposals for the construction of two steel hull 24-in. dredges, Multnomah and Wahkiakum, which will be received at his office, 321 Custom house, until 11:00 a. m., Sept. 30, 1912. Information may be obtained by application to J. F. McIndoe, major of engineers.

Isherwood System of Construction

The First of a Series of Articles Describing in Detail the Construction of a Small Steamer of This Type

By Robert Curr

Robert Curr begins in this issue a series of articles on a vessel, 203 ft. long, 40 ft. beam and 18 ft. deep of the Isherwood type, describing the method of computing the calculations necessary in designing the ship as well as showing how to order materials and how to build the vessel. Estimating the cost of labor and materials will also be shown in these articles. Every problem will be discussed, even to the shipbuilder's point of view on the unsinkable ship. Not a section will be overlooked and a reason will be given for the location of everything in the ship. This ship is of such convenient size that it will be comparatively easy for those interested in shipbuilding to grasp and master all the problems presented.

Specifications for Steel Steamship.

General Description.

To be a single deck bulk freight steamer.

Top gallant forecastle forward with deck laid flush, steel texas and pilot house on same.

Steel deck house aft containing dining rooms, galley and crew's quarters.

Accommodation for such part of crew as are not housed in after deck house to be in forecastle, boiler house or between decks aft.

Four cargo hatches spaced 24 ft. centers, with bulb angle coamings, wooden covers and patent hatch fasteners.

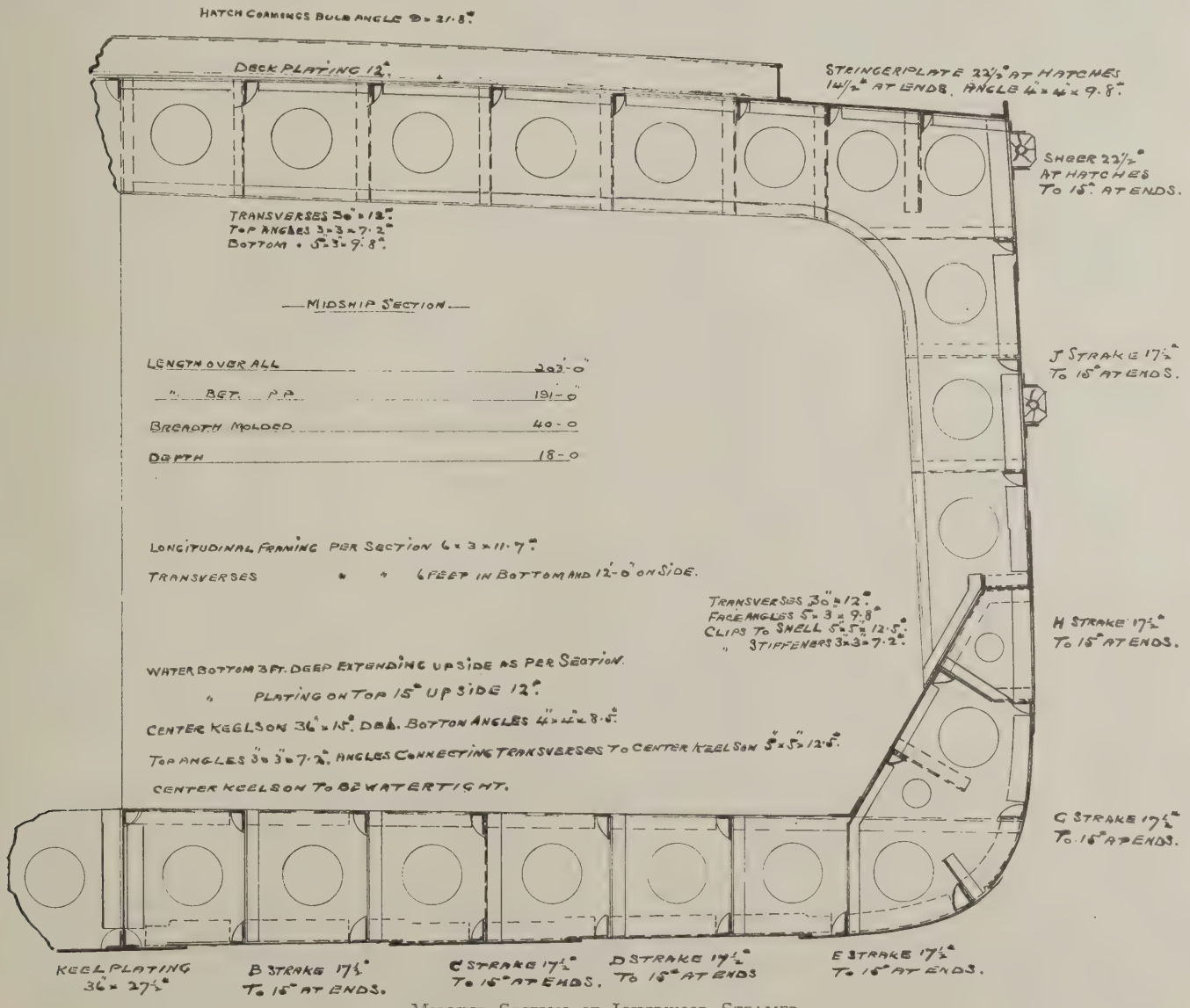
Water bottom to be 36 in. deep at center, with 3 in. of a camber and extending up the bilges for 5 ft.; tapering from 4 ft. at the tank top to 12 in. at the top on ship side. This side tank to extend from the coal bunker bulkhead to fore peak bulkhead. The water bottom to extend from forepeak bulkhead to stuffing box bulkhead and divided by center keelson and solid floors all water-tight.

Transverses to be spaced 6 ft. and webs 12 ft. throughout.

Triple-expansion engines placed aft and two Scotch boilers on tank top with fire room before them.

Coal bunkers at fore-end of stokehold, with 100 tons capacity.

To be built on the Isherwood system, with one intercostal longitudinal


HATCH COAMINGS BULB ANGLE 9 × 21.8#
DECK PLATING 12#
STRINGERPLATE 22½# AT HATCHES 14½# AT ENDS. ANGLE 4" × 4" × 9.8#
SHEER 22½# AT HATCHES TO 15# AT ENDS.
TRANSVERSES 30" × 12#
TOP ANGLES 3 × 3 × 7.2#
BOTTOM " 5" 3 × 9.8#
—MIDSHIP SECTION—
LENGTH OVER ALL 203'-0"
" BET. P.P. 191'-0"
BREADTH MOLDED 40-0
DEPTH 18-0
LONGITUDINAL FRAMING PER SECTION 6 × 3 × 11.7#
TRANSVERSES " " 6 FEET IN BOTTOM AND 12'-0" ON SIDE.
TRANSVERSES 30" × 12#
FACE ANGLES 5" × 3 × 9.8
CLIPS TO SHELL 5" 5" × 12.5#
" STIFFENERS 3 × 3 × 7.2#
WATER BOTTOM 3 FT. DEEP EXTENDING UP SIDE AS PER SECTION.
" PLATING ON TOP 15# UP SIDE 12#
CENTER KEELSON 36" × 15# DBL. BOTTOM ANGLES 4" × 4" × 8.5#
TOP ANGLES 3" 3" × 7.2#. ANGLES CONNECTING TRANSVERSES TO CENTER KEELSON 5" × 5" × 12.8#
CENTER KEELSON TO BE WATERTIGHT.
J STRAKE 17½# TO 15# AT ENDS.
H STRAKE 17½# TO 15# AT ENDS.
G STRAKE 17½# TO 15# AT ENDS.
KEEL PLATING 36" × 27½#
B STRAKE 17½# TO 15# AT ENDS.
C STRAKE 17½# TO 15# AT ENDS.
D STRAKE 17½# TO 15# AT ENDS
E STRAKE 17½# TO 15# AT ENDS.

MIDSHIP SECTION OF ISHERWOOD STEAMER

at side continuous longitudinal framing and transverses scored out for same on bottom, side, tank top and spar deck. Spar deck to be steel and continuous.

Forecastle deck and main deck aft of steel. The scantlings throughout, material and workmanship, to be in accordance with these specifications and all including machinery and electric light plant to be first class.

Material

All plates and shapes to be mild open-hearth steel, tested at the mill to the following specifications: Tensile strength to be not less than 54,000, not more than 62,000 lb. per sq. in.; limit of phosphorus not to exceed 0.08; elongation to be not less than 24 per cent in 8 in. Reduction to be not less than 45 per cent. Reports of test to be furnished with invoices, and plates are not to run over or under theoretical weight more than 2½ per cent.

Rivets to be of the best open-hearth steel. Tensile strength to be not less than 52,000, nor more than 62,000 lb. per sq. in. Limit of phosphorus not to exceed 0.04, and limit of sulphur not to exceed 0.04. All material to stand work of shipment without injury.

Dimensions

Length over all	203 ft.
Length between P. P.	191 ft.
Width molded	40 ft.
Depth	18 ft.

Stem

To be the best hammered scrap iron, forged in one piece 8 in. wide and 2½ in. thick; the lower end to conform to the shape of fore-foot and to extend back far enough to form an efficient connection with the keel; the head to be carried above the forecastle deck rail to make a neat finish and to be reduced to 7 in. x 2 in. section beginning the taper above the load water line.

Stern Frame

To be of the best hammered scrap iron in one forging, with a suitable boss forged on for stern pipe, to be 8 in. wide and 5 in. thick below the boss and 4 in. thick above.

The upper end to conform to the shape of the counter and to extend high enough to be efficiently connected to the transom frame.

The lower end to extend with a fair taper forward not less than 7 ft. long, and well secured to the keel plates.

The shoe to be forged on the post, and to be 10 in. wide and 6 in. thick, the end to have forged hub to receive pintle of rudder. Brass bushing to be fitted for rudder-pintle.

Rudder

To be of the balanced type, made of the best hammered scrap iron, forged in one piece, with one cross stay. To be made to ship and unship while the vessel is afloat.

The frame to be covered on both sides with 12.5 lb. steel plates, the space between the plates to be filled in solid with wood.

The rudder to be hung on the transom floor, and to be fitted with proper bearings, and clamps. Stock to extend through spar deck with eye bolt in end for shipping.

Rudder to be operated by a quadrant below spar deck. Spare tiller of cast steel or wrought iron to be furnished.

Transverses.

From stem to fore-end of engine room, transverses composed of 12.5 lb. plate, intercostal clips 3 in. x 3 in. x 7.2 lb. angles. The plates to be depth of water bottom, and spaced 6 ft. apart.

In the hold the transverses will form webs 30 in. deep and spaced 12 ft. apart.

On the face of hold transverses, an angle will be fitted on same 5 in. by 3 in. by 9.8 lb.

The top of transverse riveted to the deck will be 30 in. wide and scored out for longitudinal frames to pass through. Transverses in bottom to be scored out top and bottom to allow the longitudinal frames to pass through.

On the side the transverses will be scored out for the longitudinals on the shell plating.

In the engine room the transverses will be spaced 36 in. apart in bottom.

Longitudinal Framing

Throughout, from stem to stern post, the frames will run lengthways from bulkhead to bulkhead, and bracketed to same with plate brackets and a sufficient number of rivets equal to the area of section of the continuous frame. The longitudinal frames to be of angle 6 in. by 3 in. by 11.7 lb. spaced 32 in. apart in the water bottom.

Longitudinals on side to be of angle 6 in. by 3 in. by 11.7 lb. 30-in. spacing above the water bottom.

Londitudinals on spar deck to be of 6 in. by 3 in. by 11.7 lb. spaced 33 in. apart.

Center Keelson

To be 36 in. deep, of 15-lb. plate, connected to keel plate with double angles 4 in. by 4 in. by 8.5 lb. and to tank top with single angle 3 in. by 3 in. by 7.2 lb. To extend as far fore and aft as may be practicable, and to be made water-tight in water bottom.

Tank Top

To extend from collision to stuffing box bulkhead, to be of 15-lb. plate. From the coal bunker bulkhead to the collision bulkhead the tank plating, 12½ lb. at side, will extend above tank at side of vessel 5 ft., the top of same being formed of channel 12 in. by 25 in.

Keel

To be 36 in. by 27 lb. plate in one thickness, all fore and aft. Keel bars to be joggled over butt straps.

Hull Plating

Between keel and sheer strakes, 17½ lb., reduced to 15½ lb. at ends.

Sheer strake K. 22 lb. in way of hatches, reduced to 15½ lb. at end.

Plating to be doubled around the hawser pipe. All strakes to be wrought in fair lines and have butts and seams lapped and made thoroughly water-tight.

An efficient arrangement of butts to be adopted. No liners to be fitted between transverses and shell plating.

Shell plating in way of water-tight bulkheads to be reinforced by suitable diamond shaped liners.

Spar Deck

Stringer to be in one width to hatches, 72 in. by 22 lb. in way of hatches. Inside of forecastle and abaft after house to be reduced to 15½ lb.

Plating, 12 lb.; longitudinals, 6 by 3 by 11.7 lb.; hatches, 27 ft. by 8 ft. by 24 ft. centers; coamings, 9 in. by 21.8 bulb angles; forecastle deck plating, 10.2 lb. laid flush.

Bulkheads

To be five in number. Collision bulkhead abaft the stem; one bulkhead in hold, coal bunker, boiler room, engine room and stuffing box bulkhead. Collision and stuffing box bulkhead, 12½ lb. Balance 10 lb. plating.

Floating Dry Dock for Montreal

Description of the Structure Which Messrs. Vickers Have Built for Their New Canadian Establishment

MESSRS. Vickers, Ltd., last month started on her voyage to Canada, the floating ship dry dock built at their naval construction works at Barrow-in-Furness for their new establishment at Montreal. This dock is one of the largest yet built. It is capable of docking the largest existing vessel in the British navy. It is of the double-sided self-docking type, on the principle known as the "bolted sectional". It consists of a pontoon or lifting portion of the dock, and two parallel side walls, built on to and forming part of the same, and the whole length is divided into three complete and separate sections, which, when bolted together, form the complete dock. These sections are so arranged that when the dock is separated into its three parts, any two of them can dock the remaining third between them. For this purpose each section is fitted with its own independent pumping machinery, so that it can also act as an independent unit.

The general dimensions of the dock are as follows:

	Ft.	In.
Length over platforms	600	0
Length over pontoons	550	6
Width over all	135	0
Depth of pontoon at center	17	0
Length of side walls	470	6
Height of side walls above pontoon deck	42	0
Width of side wall at base	17	6
Width of side wall at top	12	6
Clear width between roller fenders	100	0
Draught of vessel	27	6
Lifting capacity, tons	25,000	

The construction of the dock is such as to make it suitable for lifting a modern British battleship, the pontoon deck being specially stiffened to allow it to support a large portion of the weight of the vessel on side or bilge, as well as central, keels.

Divided Into Three Sections

The pontoon consists of a rectangular structure plated in all round with the exception of the portion of the deck which comes directly under the walls, and stiffened internally by longitudinal and transverse girders. It is divided into three sections by joint chambers. The two end sections have their outer extremities built in the form of a point or bow terminating in a working platform carried on plate and braced girders. The bottom plating, except under the walls, is arranged to run transversely, and is connected to the plating of the sides and points by chine angles; the top or deck plating, similarly arranged, is connected to the face of the side wall by chine angles. The pontoon is divided into four compartments by three longitudinal intercostal water-tight plate-bulkheads. Transversely the pontoon is divided into 54 bays, 20 in the central section and 17 in each end section, by transverse girders, consisting of plate-bulkheads. In the compartments under the walls the plate-girders are replaced by special lattice-girders.

In addition to the bulkheads, the deck and bottom platings are stiffened by means of a series of longitudinal frames which run fore and aft over the length of the pontoon, intercostal between the transverse girders. In addition to the transverse lattice-girder under the wall, intermediate transverse ordinary frames are fitted 2 ft. 6 in. apart, and are prolonged upwards, forming the ordinary frames of the walls. The central bulkhead between the transverse girders is stiffened by vertical "breathing" plates, which are well stiffened and connected to a longitudinal curtain-plate. Outside this framing of breathing plates and longitudinal curtain-plate, the pontoon deck and bottom are stiffened by longitudinal framings consisting of angles, connected to the transverse bulkhead stiffeners by gussets and diagonals. These framings extend to the line of the face of the wall. In the center section several of these frames are provided with plates riveted to them, to take the load from the side keel-blocks. The intermediate longitudinal bulkheads are formed of vertical plates, intercostal between the transverse girders, to which they are attached, as they are also to the top and bottom plating. To facilitate the complete withdrawal of all water in the pontoon, shallow troughs are fitted, which form a gutter.

Horizontal Plating

The walls of the dock are plated horizontally and have a batter on the face or inside wall. The top deck of the walls is plated longitudinally, and is connected to the side plating by double-chine angles. An engine-deck, on which is placed all the machinery of the dock, is fitted about 16 ft. below the top deck, and is arranged water tight. Each wall is divided, in addition to the joint chambers, into ten water-tight divisions by plate bulkheads, coming in line with the bulkheads in the pontoon, of which they are a continuation. At each end of the wall a docking land is formed, on which the central portion can rest when being self-docked. The framing of the walls is of two types, braced and ordinary.

In line with the transverse girders of the pontoons, of which they form a continuation, the frames consist of single angles stiffened by vertical web-plates, the front and back frames being cross-connected by a series of diagonals and gussets. The ordinary frames of the walls consist of single angles back and front, cross-connected by a series of horizontal struts. Special stiffening is fitted in way of the machinery. About 1 ft. below the top deck a running deck is provided for enabling ropes to be easily handled and run from one end of the dock to the other outside the stanchions. Timber-heads and such fittings required in berthing vessels are fitted on this deck. At a distance of about 15 ft. and 29 ft. respectively below the running deck, two further stages, known respectively as painting and shoring stages, are provided.

Can Work in Independent Units

Each end of the central section and each square end of the terminal sections is provided with a joint chamber, by means of which the sections can be joined together or parted. For the purpose of dealing with commercial vessels, which ordinarily will not have the weight or dimensions of the Dreadnoughts, the dock has been designed so that it can work when required in two independent units of unequal size, and to facilitate the rapid connection of the two portions, cast steel rocking joints, in the form of knuckles, are fitted at the level of the keel blocks. The pumping installation of the dock is driven by steam generated in boilers carried on the dock itself. Each section of the dock has its own complete pumping installation, and each installation consists of two boilers and two engines and pumps installed

in specially constructed chambers on one of the walls.

The pumps, which are of the centrifugal type, 17 in. in diameter, are seated on a main drain at the bottom of the dock, which is continued over practically the whole length of each section. From the main-drain compartment pipes are led to each separate water-tight division of the dock. Each compartment is governed by its own separate valve, and the main inlet pipe and pump discharge pipe are governed by separate screw-down valves, and in addition have each a non-return flap-valve on the outside. The compartment valves of each section of the dock are all operated from a valve-house placed on the top deck of each section, by means of the Westinghouse electro-pneumatic system, which is based on the principle of operating presses by compressed air and controlling the same from a distance by means of valves operated by an electro-magnet. Each valve house is in telephonic communication with its respective engine room and also with the others when the dock is working as a single unit.

Pumping Equipment

Each section of the dock is also provided with a direct-acting steam-pump, arranged to draw from the sea, and capable of providing a full stream of water for fire service or washing down vessels. These pumps are also connected to the main drain, so that they may be used as a drainage service for completely emptying the compartments. Two similar steam pumps are also fitted on the opposite wall of the dock.

Steam heating is provided to prevent water in the compartments from freezing, and also for the mechanism that could be affected by frost. Each water tight compartment is provided with the Gardner & Ferguson indicating system, to show, in the valve house, the level of the water inside it. Similar gear is also provided for indicating the draught of water over the keel blocks. The dock is provided with eight steam capstans, four on each wall. The spindles of the capstans are carried down vertically to the level of the pontoon deck, where, in a small chamber in the wall at this level, cable lifters are fitted, so that the mooring cables may be hauled in or paid out when the dock is being moved about. Donkey boilers are provided on the wall remote from that in which the main boilers are fitted, to provide steam for the capstans and fire pumps fitted on that wall. On the top deck of this wall a 3-ton electric traveling gantry crane is fitted and arranged to traverse the whole length of the wall. At both ends of the combined dock a pair of flying gangways or swinging bridges are fitted, affording access from one wall to the other.

Lighted by Electricity

The dock will be lighted throughout the machinery compartments by means of electric lamps. The outside lighting consists of bracket standards, each supporting a cluster of lamps. Box terminals are also fitted on the walls, from which lamp clusters can be taken by flexible leads for lighting any particular portion of the ship on the dock. Electric current will be supplied through cables from the shore.

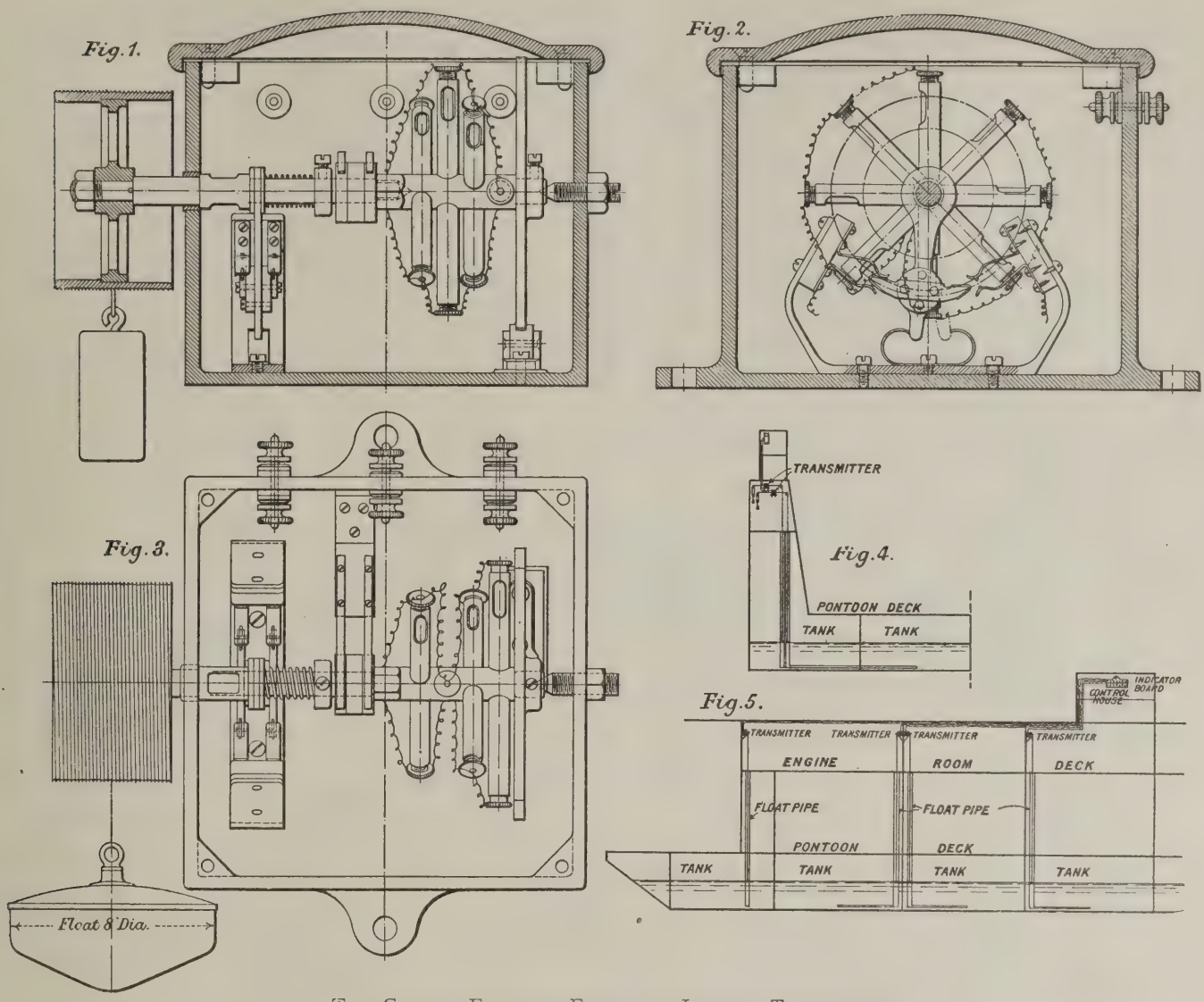
The dock is provided with the usual bollards and timber heads. Roller fenders are also fitted to protect the walls of the dock from an entering steamer. Eight mechanical side shores, four on each wall, are provided. These can be screwed in or out by a standard fitted on the top deck. Keel blocks, side or docking keel blocks, and bilge blocks are provided; the latter are arranged to be pulled in or out to suit the shape of the ship when she has taken the keel-blocks. The keel blocks are strongly made and closely spaced, to enable them to take the weight of the heaviest and most modern ironclads. Ladders are fitted leading from the upper deck of the dock to the pontoon deck, and also into the various compartments of the dock. Suitable hand rails are fitted all round the top deck.

Ventilation by means of cowls and downcast pipes is arranged to each boiler and engine room, and also to the interior of the walls. A valve house large enough to contain the valve control table and the recording instruments is fitted on the top deck of each of the three sections; each valve house contains the apparatus necessary for controlling the valves of its own particular section.

Electric Impulse Transmitter

The Gardner-Ferguson electrical impulse transmitter is an instrument which has been devised with a view to obtaining regular and incremental electrical impulses from any motion in any position, and transmitting these impulses to any distance and there reproducing them synchronously, thus forming a history of a motion no matter what it is. In essence the apparatus consists of a spindle which is rotated, or oscillated, by the motion of which a record or observation at a distance is required. On this spindle are diametrically mounted one or more straight glass tubes which have a platinum wire fused into each of their closed ends, the tubes being partially filled with a special mixture, of which mercury is the principal component. On the requisite movement of the spindle the tube, or tubes, alternately pass through the horizontal plane, thereby causing the mercurial mixture to flow in the tube and make a momentary electrical connection between the end platinum wires and allowing an electrical impulse to flow. Collecting-rings are fixed on the spindle, and by means of these the impuse current is conducted through the external circuit to any distance which may be required. A simple mechanical device is attached to the spindle which prevents the tubes from stopping in the horizontal plane and thus causing a short-circuit.

The instrument as described above is in its most simple form, and is suitable for a motion in one direction only, as, for example, from the index or counter of any form of meter, or for the transmission of time from a master-clock to any number of synchronizing dials. If, on the other hand, the motion is reciprocating, regular or irregular, sometimes in one direction and sometimes in another, a simple commutator is fitted, which is operated by the same spindle which carries the glass tubes. An instrument with four glass tubes, and fitted with such a commutator for reciprocating motion, is illustrated in Figs. 1 to 3. The arrangement of the commutator will be clearly understood from these figures. It is in essence a change-over switch, the moving part of which is carried by an arm which rides on the spindle, and the fixed part of which consists of two contacts carried by brackets from the bottom of the case, as shown. The moving arm is spring-controlled, so that as the spindle begins to move in the direction different from its previous motion, the arm springs across and makes contact with the opposite pair of contacts from that it was previously in connection with. The two contacts are connected up so that each sends the impulses in the transmission circuit in an opposite direction from the other. It is usual to make the transmission circuit with a single wire and an earth return, but a three-wire arrangement can be used if desired. It is obvious that the glass tubes form the only part of this apparatus which can be looked upon as of a special and more or less untried nature, but exhaustive tests have been made of its reliability. Tubes have been selected at random, and individu-



THE GARDNER-FERGUSON ELECTRICAL IMPULSE TRANSMITTER

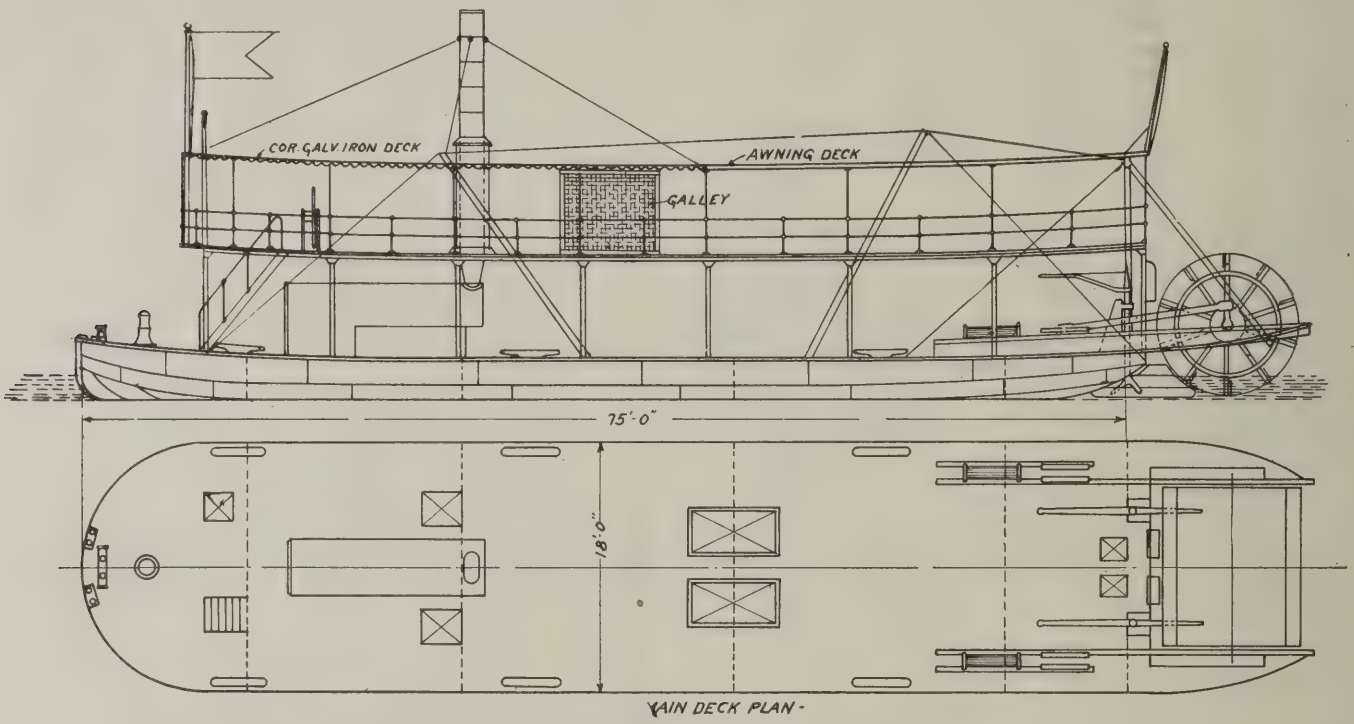
ally subjected to 5,000 electrical flashes at a pressure of 220 volts, coming through the ordeal absolutely unimpaired, the usual electrical pressure employed in working rarely exceeding 12 volts, so that the tests indicate an endless life to the tube under normal conditions.

The receiver employed to manifest the impulses is of a very simple nature. For short distance transmission the impulse current energizes an electro-magnet, thereby pulling down an armature, this armature, acting through a lever rotating a toothed wheel one tooth at a time, either from left to right, or vice versa, as the case may be. An important point in connection with this arrangement is that the toothed wheel is locked on the succeeding tooth as soon as the armature starts from rest, and before the wheel even moves. It is simply a matter of suitable gearing thereafter to obtain the desired indications. For long-distance work, where the impulse is too much attenuated to operate magnets, the impulse is caused to temporarily bias the balance of a polarized relay; this connects in a local battery which simply does the work of operating the magnets, so causing the receiver to move one way or the other synchronously with the original motion. The receivers are designed to work either with or without a recording arrangement, as may be desired, such records not in any way affecting the precision of the instrument. The records will be found to be an exact history of the motion as regards time.

It may be used, for instance, for time-keeping, a master clock operating a number of dials, or it may be used for the transmission of meter readings, and the reading of counters of all kinds. It may also be used to indicate liquid levels, as, for instance, reservoir or water-tank levels, oil-tank or chemical tank levels, river water levels, tide levels, etc. It is also suitable for the transmission of pressure indications. This apparatus was utilized for indicating on the launching platform of the Japanese battle-cruiser Kongo at the Vickers Works, Barrow-in-Furness, the depth of water on the end of the launchways, and the speed of the rise of the tide in the channel into which the vessel was launched. As a reliable transmitter of depths of liquid levels the Gardner-Ferguson invention supplies a long-felt want, which owners of floating docks, wet docks, oil-storage tanks, oil-carrying steamers, etc., have not been slow in appreciating, and a large number of instruments for these purposes are now being supplied. An application of the apparatus to a floating dock for indicating the depth of water in the tanks is illustrated in Figs. 4 and 5. It has been fitted on the new floating dock for Montreal. The manufacturing rights of the transmitter have been acquired by Chadburn's Ship Telegraph Co., Liverpool.

Towboats for South America

James Rees & Sons Co., Pittsburgh, Pa., has built up quite an extended business in the construction of towboats and barges for service in Central and South American waters. The vessels are shipped by the company in a knocked-down condition to the point of destination and there assembled. At present the company is building three stern-wheel towboats and six flat rake barges for the Madeira-Mamore Railway Co. The towboats are of the stern-wheel type, 75 ft. long, 18 ft. beam and 3 ft. deep, with an 18-in. sheer forward. The hull is constructed of open-hearth and angle steel throughout, the plating being galvanized and double riveted. There are four cross bulkheads and one center fore and aft bulkhead. The barges are 75 ft. long, 18 ft. beam and 3 ft. depth of hold with 12-in. sheer and having a corrugated steel cargo box. They are constructed of open-hearth and angle steel throughout, double riveted and plating all galvanized.



PROFILE AND MAIN DECK PLAN OF STERNWHEEL TOWBOATS FOR THE MADEIRA-MAMORE RAILWAY BUILDING BY JAMES REES & SONS CO., PITTSBURGH

Question of Smaller Battleships

Naval authorities in Britain just now, as well as shipbuilders, are busy arguing the pros and cons of smaller battleships and it seems possible that Great Britain will lead the way back again to battleships of medium tonnage, just as she did to Dreadnoughts. Perhaps this movement may have its effect on the passenger line companies, and at any rate should it have any result, it will be hailed with satisfaction by a large majority of shipbuilders and would also have its effect on the demand for labor.

Sir William H. White, late chief constructor to the British admiralty, is head of a growing school of thought which contests the wisdom of Sir John Fisher and his colleagues and their Dreadnought policy.

Sir William White's views are that a wiser course in warship building would be found in a return to more moderate dimensions and a reduced unit cost for capital ships than have recently found favor. Experience had established the fact that, without having resort to extreme dimensions, it was possible to produce capital ships which would be powerfully armed, well protected, steady gun platforms, capable of fighting their guns in all weathers when actions could take place, and able to maintain their speed in rough weather.

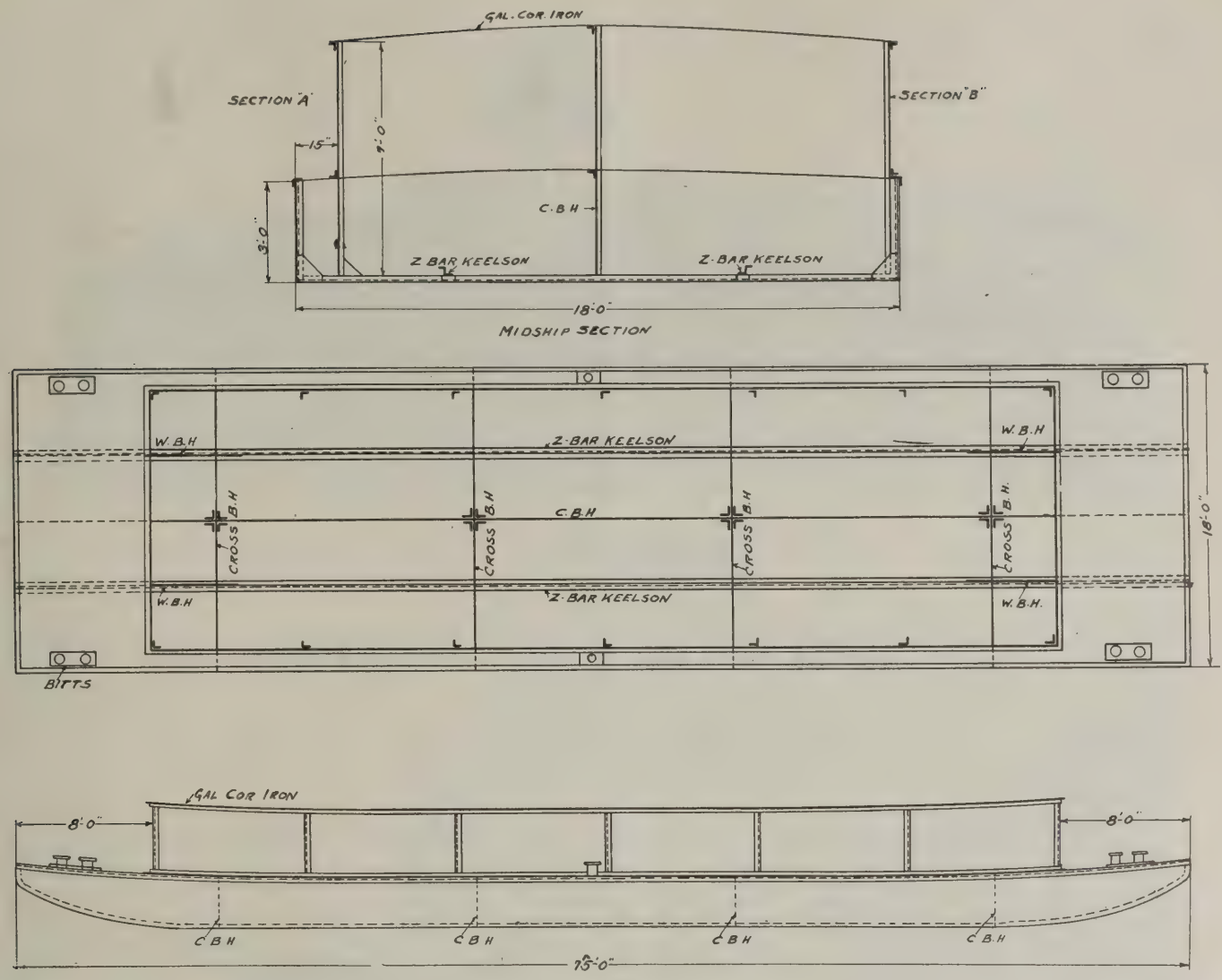
Admiral Sir Reginald Constance points out that in the Russo-Japanese and Spanish-American wars the defeated ships were generally beaten before their floating power was compromised and the armored hulls of the victors did not exercise any decisive influence on the results. As the ship need not be made absolutely unsinkable, but only sufficiently so to win victory, should not the difficulty of hitting the water line, he asks, be carefully considered before diverting large weights from guns,—the most effective form of defense—to armor which gives imperfect protection?

Launch of Steamship Pastores

Workman, Clark & Co., Belfast, launched from their South yard a new twin screw steamer, built by them for the United Fruit Co., and to engage in the general fruit carrying and passenger service between New York and West Indian ports. The Pastores is 486 ft. in length, with a gross tonnage of about 8,000 tons, and has been built in accordance with the requirements of the British Corporation Registry of Shipping, the British Board of Trade and the United States Steamship Inspection Service.

A special feature of the vessel is the accommodation for about 150 first class passengers in which comfort and artistic taste are admirably combined. The staterooms, arranged for one, two and three persons, are all roomy apartments, a number of them being so arranged with doors and adjoining lavatories as to be available for family suites, while there are also seven special cabins luxuriously furnished and provided with separate lavatories.

The public rooms include commodious dining saloon, with tables arranged on the restaurant plan, a luxurious music room opening off the main entrance hall; also a comfortable smokeroom. All the rooms, public and private, are efficiently ventilated by means of cooled fresh air delivered through ducts, while each



SECTIONAL VIEW OF STEEL TOW BARGES FOR THE MADEIRA-MAMORE RAILWAY CO.

room is also provided with electrically-driven fans.

The cargo space of the vessel is divided into nine compartments, all specially insulated and prepared for the carriage of fruit in bulk. This perishable cargo will be preserved during transit by means of cooled fresh air delivered by electrically-driven fans through ducts from the refrigerating rooms to each compartment.

The propelling machinery consists of two independent sets of quadruple-expansion engines of approved design, complete with all necessary auxiliary machinery and supplied with steam from three double-ended and one single-ended steel cylindrical multitubular boilers.

The Samuel L. Moore & Sons Corporation, Elizabeth, N. J., are developing a type of freight-carrying power boat for shoal water service and have recently turned out one 64 ft. long, 16 ft. beam and 6 ft. deep.

A Remarkable Tow

The tug Reliance (formerly the M. E. Scully) owned by the Isthmian Canal commission, has recently completed a remarkable trip with three barges in tow. She left Cristobal Feb. 11 for Panama bay via the Straits of Magellan, reaching her destination on June 17 after a voyage of 126 days and 10,500 miles. The number of actual steaming days was 86. Heavy seas were occasionally encountered which kept their decks awash. The Reliance is fitted with a No. 3 Providence steam towing machine of the Shaw & Spiegle pattern, having double cylinders 14 in. in diameter and 14 in. stroke, using 1,200 ft. of 1¾ in. steel wire hawser. Instances have been noted from time to time of steamers taking a single barge in tow from New York to San Francisco and from New York to Liverpool, but this is believed to be the first time that a tug has ever attempted a triple tow for such a distance. The trip certainly demonstrates the advantage to be derived from using a towing machine, which relieves the sudden shocks and strains upon the hawser.

W. R. Grace & Co.'s Plans

W. R. Grace & Co. have made extensive plans for the development of the coast-to-coast trade upon the opening of the Panama canal. Four steamers for this service are now building at Philadelphia, which will be of 10,000 tons each, 405 ft. long and 54 ft. beam. Upon their completion, about July, 1913, a fortnightly sailing service will be inaugurated between New York and San Francisco from each port. With the addition of the three steamers now building in England and destined for the New York and West Coast South American trade, via the Straits of Magellan, the fleet of Grace & Co. will number 16 steamers. The steamers under the British flag will be operated by the New York & Pacific Steamship Co., which is controlled by Grace & Co.

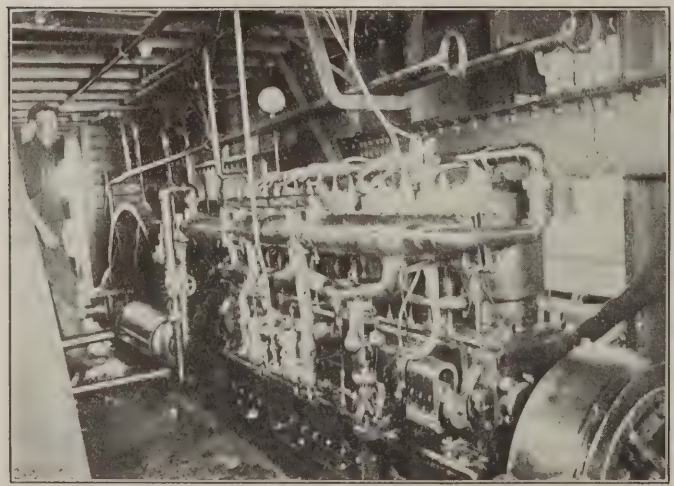
Broadside View of Gasoline Car Ferry Henderson

Gasoline Car Ferry

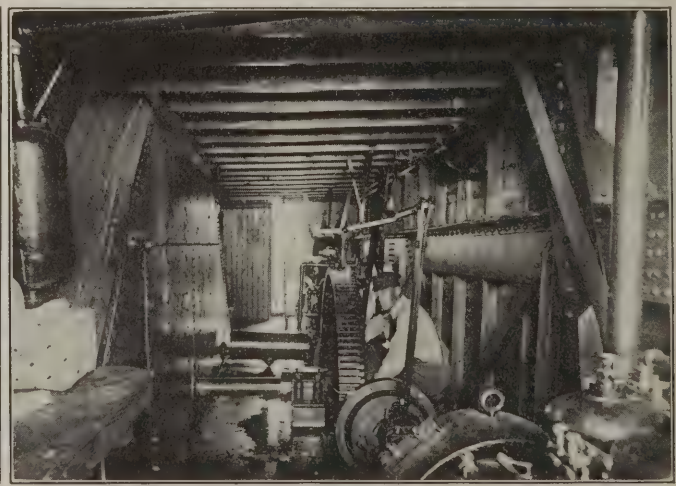
Showing the Adaptability of This Form of Power to a Wide Variety of Uses

The Evansville Railway Co., Evansville, Ind., has recently established a car ferry service across the river at Henderson, Ky., which marks a somewhat interesting departure for craft of this character. The car ferry is designed to transport the interurban cars across the river, making it unnecessary for the passengers to change cars. The interesting point about the ferry is that it is propelled by two 54-H. P. Buffalo gasoline engines, 7 in. bore and 9 in. stroke, with a normal speed of 350 R. P. M. Each engine drives one side paddle wheel but additional gearing is provided so that one engine may operate both wheels if necessary. Power is transmitted to the wheel shafts through large bevel gears at a ratio of 10 to 1. The paddle wheels are 10 ft. in diameter, 3 ft. wide and have 20 blades 18 in. deep. The conditions of service are such that the car ferry is required to make only one round trip every hour, whereas it can cross the river in 6 minutes with the current and 8 minutes against. Obviously she has much idle time while waiting for the interurban cars to arrive. With a steam plant this would mean a waste of fuel, as steam would have to be kept up all the while. With the gasoline engine when the ferry stops the consumption of gasoline stops. Economy therefore dictated the use of this form of power.

The ferry was designed by Morris H. Whitaker of Nyack-on-Hudson, and is constructed entirely of steel, being 130 ft. over all, 34½ ft. beam on deck, 25½ ft. beam on water line. Her displacement in light condition is 88 tons, and in loaded condition with two interurban cars 150 tons. The general design of the car ferry is well shown in the accompanying illustrations. The track is placed in the center of the boat, and the cars run aboard under their own power. The pilot house is carried on stanch-



Engine Room, Car Ferry Henderson, Looking Aft, Showing Starboard Motor



Port View of Engine Room of Car Ferry Henderson, Looking Forward, Showing Clutches, Gearing, Etc.

ions amidships well above the wires and is flanked on both sides by little deck houses which protect the port and starboard engines. The crew consists of four men, including the pilot.

The gasoline tanks are placed on top of the houses over the engines. It was the desire of the railway company to have a boat of as light draught as possible and of low freeboard, so as to get the weights as low as possible. This necessitated a very shallow hull and in order to get requisite fore and aft strength, the designer worked out a pair of bridge girders, the bottom member of which was on the bottom of the hull and the upper members above the deck, the hull plating being secondary to these bridge girders and to supplement them. In fact the boat practically amounts to a pair of bridge girders plated up so as to give sufficient displacement to carry the load and be seaworthy for river service. Four watertight bulkheads were used dividing the hull into five compartments so that the boat would be floatable with any one of the middle compartments or both end compartments open to the sea.

The entire construction except the houses covering the engines and the pilot house is built of steel varying in weight from 7½ to 12½ lbs. The track is carried on two heavy yellow pine stringers bolted through the deck and supported transversely under each of the vertical struts of the bridge girder by channel beams so that the weight of the cars is transmitted directly to the bridge girder instead of to the hull proper.

The usual river type of bridge at the ends was used and the ends of the hull designed to conform with this river type of bridge.

Bilge pumps are provided on each of the main motors and also air pumps for the whistle. An independent centrifugal pump, 3 in., is connected to the flywheel at one of the main motors through clutch and silent chain drive. This pump is designed for fire and bilge purposes and so connected that water can be drawn from each of the watertight compartments of the hull and discharged overboard or can be drawn from overboard and discharged through the fire hose. Each pump has a capacity to supply 150 gals. per minute under the pressure of 200 lbs.

The boat is equipped with double rudders and steering wheels after the usual ferry boat type and a searchlight is also provided on top of the pilot house for use when making landings. The boat is fully equipped to meet government requirements for a boat of this size and purpose.

The car ferry was built by the Dubuque Iron Works, Dubuque, Ia., and a trial run was made of the journey from Dubuque to Evansville. The car ferry made an average of 8 miles an hour, and during the last 48 hours of the journey the engines were not stopped for a single second.

DECK VIEW OF CAR FERRY HENDERSON, LOOKING AFT

The White Star Line has decided to make extensive alterations in the Olympic as a result of Lord Mersey's recommendations. As soon as she is withdrawn from regular service this fall she will be sent to Belfast and subdivided longitudinally. Her present bulkheads are wholly transverse and the effect of the alterations, coupled with a water-tight deck carried well above the water line, will virtually make a double ship of her.

The Boston Iron & Metal Co., of Baltimore, which purchased the troopship Yosemite from the navy department last spring, have decided to break her up.

United States Collier Jupiter

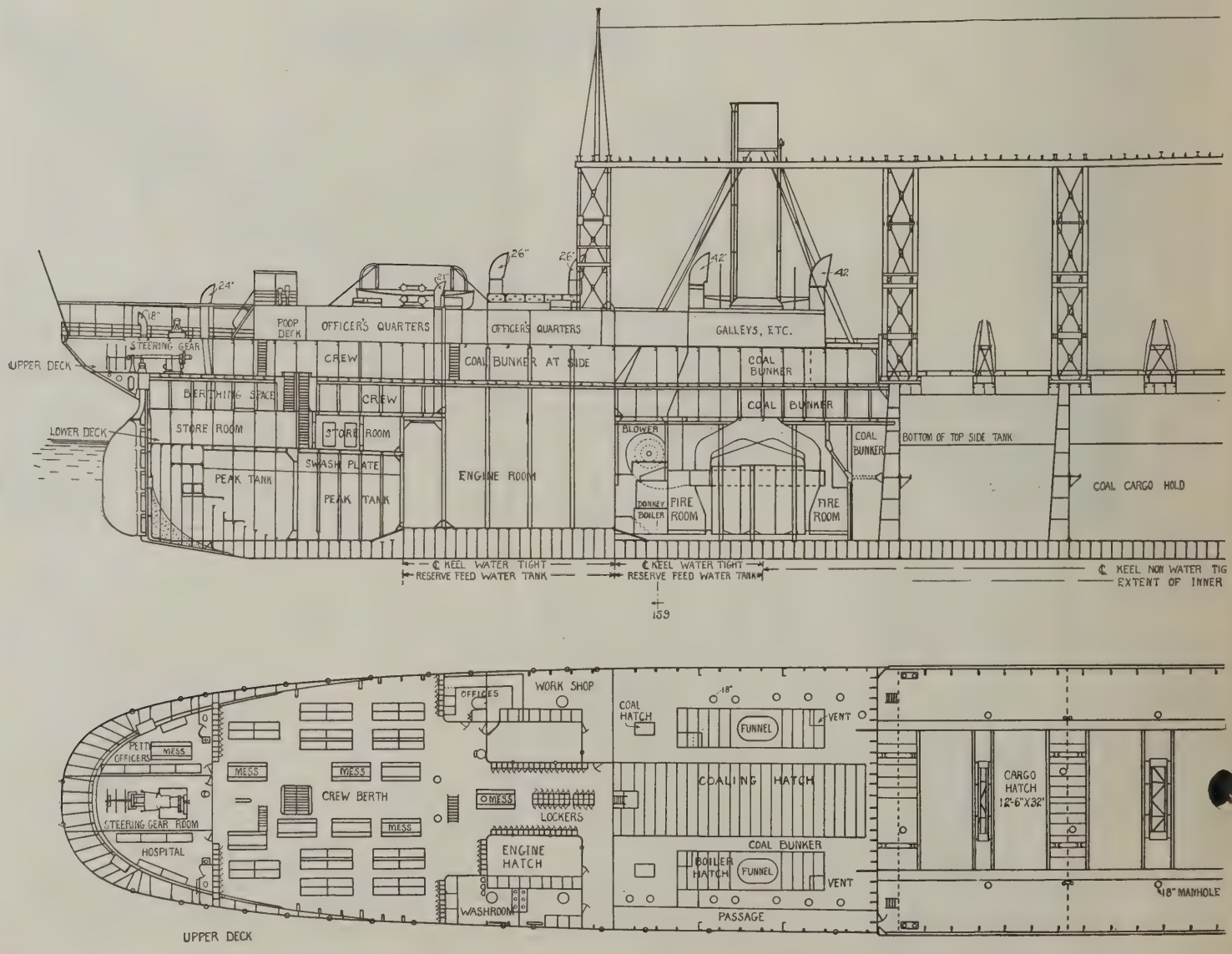
Launch of the First Electrically-Driven Collier at the Mare Island Navy Yard — Description of Hull

The United States collier Jupiter, building for the navy department at the Mare Island navy yard, was launched on Saturday, Aug. 24. She is the first electrically-driven sea-going vessel to be built for the navy department and the description of her electric drive was published in the August number of the REVIEW. The Jupiter is of the following general dimensions:

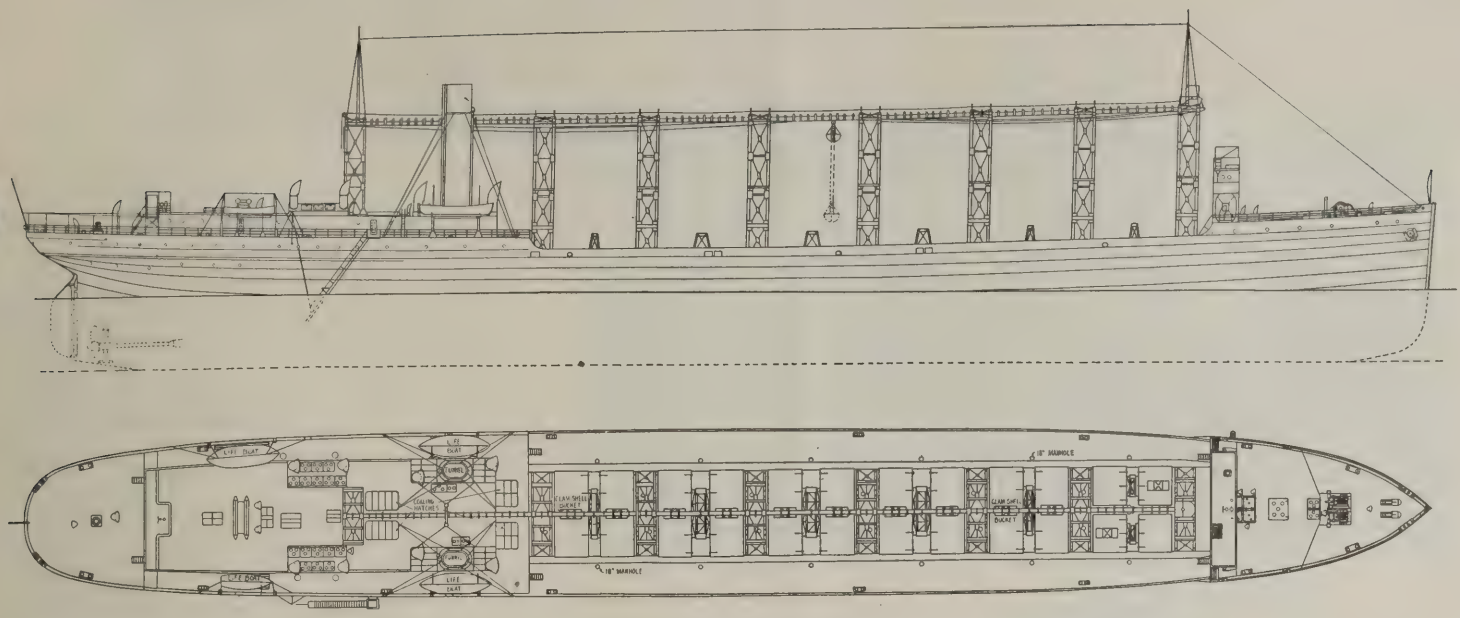
Length of hull, 542 ft.
Length between perpendiculars, 520 ft.
Breadth, 65 ft.
Depth of hold, 36 ft. 9 in.
Mean draught, 27 ft. 8 in.
Displacement, 19,132 tons.
Bunker capacity, 2,043 tons.
Cargo capacity for coal, 10,500 tons.
Designed speed, 14 knots.

The construction of the collier was authorized in the naval act passed May 13, 1908. The cost was limited to $900,000. Estimates showed that the collier could not be built for less than $1,200,000, which sum was authorized to be expended by congress on March 4, 1911.

The keel of the Jupiter was laid on Oct. 16 last, and the work of construction has proceeded rapidly since. She is a practical duplicate of the Cyclops as far as hull equipment goes. The Jupiter is of the single-deck type with forecastle, bridge and poop with double-bottom ballast tanks extending from after end of oil stowage proper to after end of engine room and upper wing ballast tanks, formed in a triangular space between the deck and side outboard of the cargo hatches. Her trimming tanks are installed in both forward and after peaks. The water ballast arrangements are such that the vessel may be maintained with not more than 1 ft. trim by head when full cargo on board and bunkers empty and not more than 2 ft. by stern with full bunkers and full cargo coal. Suitable space is provided outside of the regular cargo holds for the carrying of about 1,000 tons fuel oil in bulk. In addition, one cargo hold is so riveted and caulked and fitted with bulkhead and coffer-



INBOARD PROFILE AND UPPER

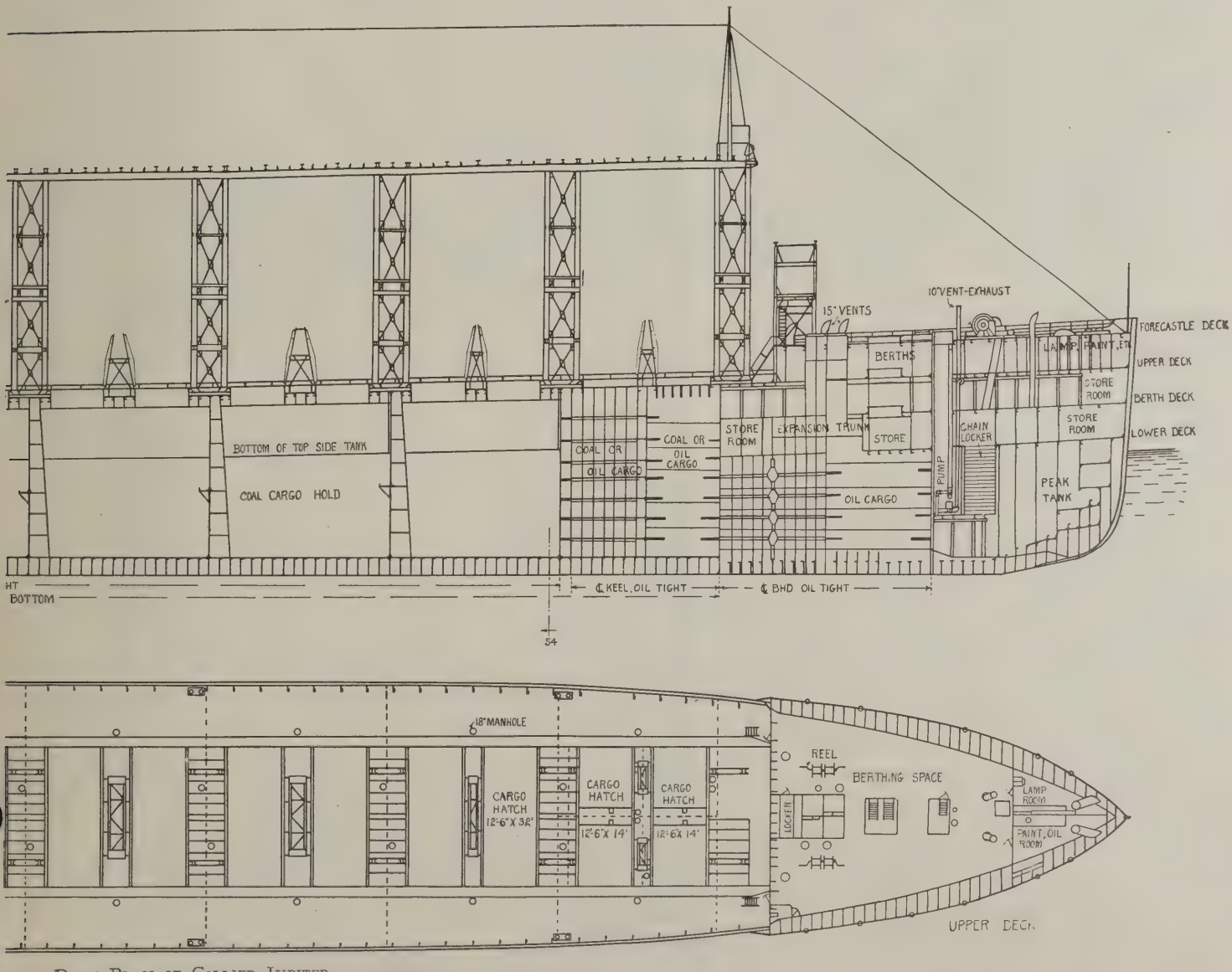


OUTBOARD PROFILE AND UPPER DECK PLAN OF COLLIER JUPITER

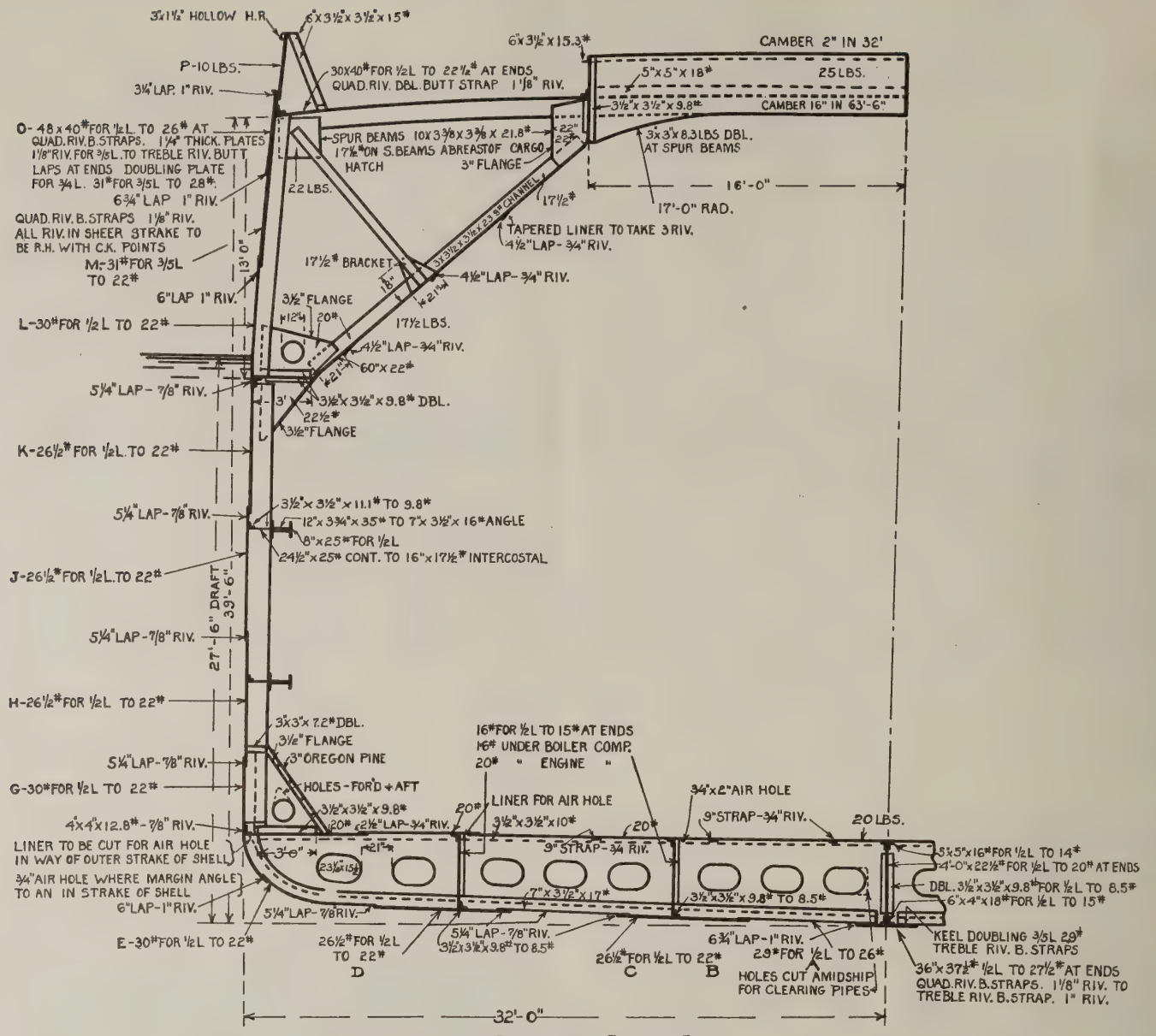
dam that it may carry either coal or oil.

The Jupiter has, of course, been designed with a view of subsequent installation of arrangements for coaling at sea and all possible interferences provided against. Coaling space has been provided on deck at both bow and stern to facilitate handling coal in bags.

The Jupiter is to have a continuous sea speed of 14 knots loaded with



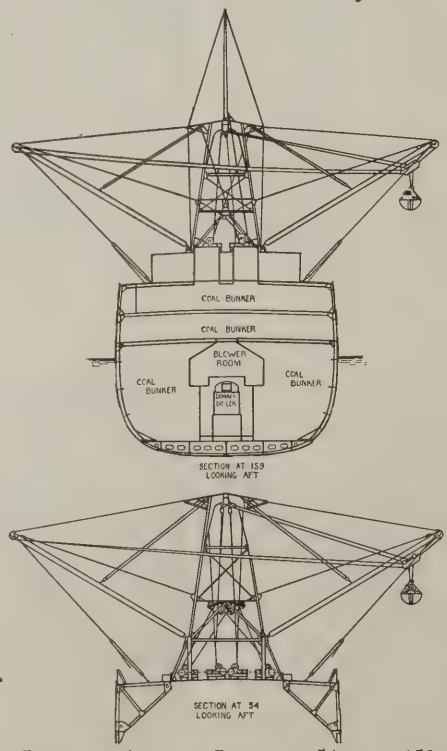
DECK PLAN OF COLLIER JUPITER



MIDSHIP SECTION OF COLLIER JUPITER

12,500 cargo and bunker coal, of which the bunker coal is to be about 2,000 tons, conveniently located for loading and trimming to fire room, 100 tons of reserve feed water, 20 tons drinking water and 130 tons for stores and crew. With the above load the mean draught molded must not exceed 27 ft. 6 in. and a free board molded to be not less than 12 ft. The beam must be sufficient to give satisfactory stability with full cargo of coal without the use of water ballast. The metacentric height shall not be less than 24 in. in full loaded condition.

The Jupiter has six cargo holds, one of which, as stated, is subdivided and fitted for oil carrying. Each hold is fitted with two hatches so constructed that coal shall be self-trimming. Provision has been made to transport coal forward and aft to prevent excessive variations of trim when bunker coal is used and arrangement by which on long trips the cargo coal may be supplemented



LOOKING AFT AT SECTIONS 54 AND 159

by bunker coal. She is fitted with masts for signaling and lookout purposes suitably located forward and aft, and suitable for coaling at sea when towing or being towed.

The Jupiter is to be provided with complete appliances for the rapid and efficient coaling of vessels along side or to storage on a wharf. For this purpose special masts or king posts are to be so arranged that cargo can be unloaded either with clamshell buckets of at least one-ton capacity, or for handling coal with large skips or standard navy bags; to be provided with all necessary winches and clamshell buckets so that each cargo hatch can be worked to coal a vessel alongside or to put coal over one side of the vessel simultaneously from all hatches. The winches to have metallic friction and to be of ample power to handle the loaded clamshell buckets, the masts or king posts and booms to be provided with all necessary standing and running rigging and gear, coaling

skips of one cubic yard capacity to be provided for each hold in addition to the clamshell buckets.

The Jupiter is to be arranged with quarters and accommodations of the character usual in a high grade cargo steamer for a crew consisting of the following: One commander, one executive navigating officer, one senior engineer, three watch officers, one medical officer, one pay officer, one boatswain, one carpenter, three warrant machinists, one pay clerk and 150 enlisted men.

The Jupiter is provided with complete system of piping for pumping the ballast in connection with the engineer's pumps, with piping for filling and discharging oil, with sanitary flushing system, baths and hand drainage pumps. A suitable system of fire protection is also to be installed in the hold.

Remarkable Case of Grounding

One of the most remarkable cases of grounding recorded in Pacific maritime annals in years was the experience of the steamship City of Seattle, owned by the Pacific Coast Steamship Co., which, after being high and dry for 15 hours, was found entirely undamaged. The steamer was able to proceed on her next voyage without docking, which seems remarkable when it is considered that she hung on a rocky bottom and was entirely out of water for hours.

The City of Seattle is a freight and passenger steamship plying regularly between Seattle and Skagway, Alaska, via ports. She is an iron steamer, of 767 tons, built at Philadelphia in 1890. On the morning of Aug. 15, while returning from Skagway with 120 passengers aboard, many of them excursionists, she went ashore at Charcoal Point, 2 miles south of Ketchikan, near the British Columbia border. The mishap was due to a dense fog. Capt. Johnson had meanwhile stopped his engines. Suddenly the vessel took the ground with scarcely a jar and when the passengers come out to breakfast four hours later they found themselves surrounded by dry land. The receding tide had left the vessel entirely out of water. So easily had the City of Seattle taken the ground that a majority of the passengers were not aware of the accident. During the day the tourists enjoyed the novel experience of walking about the Seattle and examining her hull. With the flood tide they went aboard and 15 hours after the steamer went aground she was floated on the high tide with the assistance of the steamship Northland. The accompany photograph shows the City of Seattle resting on a rocky shore waiting for the flood tide.

REMARKABLE PREDICAMENT OF A STEAMER

Many Oil Tankers Building

Of the fifty to sixty oil-tankers now building in British shipyards—chiefly on the northeast coast—at least twenty-five are for the Pearson syndicate, otherwise the Eagle Transportation Co., which is allied to the Mexican Eagle Co. This syndicate owns a large oil installation at the Manchester docks consisting of five tanks with a capacity of 12,700 tons, equivalent to 3,448,232 gallons. Many of the remaining number are for big oil corporations of the Anglo-American and British petroleum companies, who control the premier installations at the Manchester docks, viz.: Anglo-American Oil Co., 19 tanks of 20,687 tons (5,617,000 gallons) capacity, and British Petroleum Co., thirteen tanks of 46,259 tons (12,560,-520 gallons) capacity. The others are chiefly for shipowners who have been identified with the oil-carrying trade for some time, and have at least in the last two years found it an extremely profitable business. This extraordinary activity in the building of oil-tankers points to wide dispersal of oil in the near future—its distribution, in short, from the oil field to the consuming centers, and particularly to oil depots at the world's leading ports, where the fuel can be stocked ready for calling steamers.

The Eastern Steamship Corporation, of which Calvin Austin is president, has taken possession of the Dominion Atlantic Railway steamship line between Boston and Yarmouth, and will build two steamers for the service.

Some Suggestions to the Board of Trade

The British Board of Trade caused to be printed during the Titanic disacter a list of suggestions made by various correspondents on the subject of saving life at sea, and there were certainly some suggestions made. For instance one correspondent suggests that icebergs be destroyed by "radium shots." Sounds good, but expensive. Another correspondent, evidently of an ecclesiastical turn of mind, thought that all vessels hereafter should be launched in the presence of a bishop. A third suggested that the funnels be used as lifeboats—very helpful indeed, and it is curious that no architect ever thought of it before. A fourth suggested that the rudder be fitted in the engine room—and why not? It couldn't get injured by ice there. Another suggested "a device for stopping vessels by reversal of engines," which is good, but not original. Another gentleman thought that steamers should be fitted with buffers and icebergs with electric bells. Altogether 424 suggestions were submitted and some of them, of course, were good ones, as for instance that a better lookout should be kept in zones of known danger. An efficient lookout would have averted the Titanic's accident, though it is now clear that some of the wireless warnings of the proximity of icebergs never reached the bridge at all.

Capt. Ruser, executive officer of the Kaiserin Auguste Victoria, is to bring out the new Hamburg-American steamship Imperator, and has been detached from sea service in order that he may daily inspect the construction of the Imperator and be familiar with the great ship in all its details.

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September, 1912

Panama Canal Bill

Practically the last thing that congress did before it adjourned was to pass the Panama canal bill. The salient features of the bill are that it permits American vessels engaged exclusively in coastwise service to pass through the canal free of tolls; that it admits to American register foreign-built ships when owned exclusively by Americans and confined exclusively to the foreign trade, and that it forbids vessels owned in whole or in part by the railroads to pass through the canal. In addition, ship building materials necessary for the construction or repair of American vessels built in the United States are to be admitted free, but there is nothing new in this particular provision, for it has virtually been in effect during the past 15 years and very little advantage has ever been taken of it.

As soon as congress passed the bill, Great Britain protested against it for the second time on the ground that it violated the Hay-Pauncefote treaty. President Taft in signing the bill sent a memorandum to congress explaining his attitude. In discussing the British protest against the exclusion of American shipping from the payment of tolls for the use of the canal the president said that the irresistible conclusion to be drawn from the protest is that although the United States owns, controls and has paid for the canal, it is restricted by treaty from aiding its own commerce in a way that all commercial nations of the world may freely do.

The president pointed out that the rules specified in the article of the treaty which are made the basis for the British protest were adopted by the United States as a basis of the neutralizing of the canal and for no other purpose. The article he maintains is a declaration of policy by the United States that the canal shall be neutral; that the attitude of this government towards the commerce of the world is that all nations will be treated alike and that no discrimination would be made by the United States against any one of them observing the rules adopted by the United States. He maintains that it was not intended to limit or hamper the United States in the exercise of its sovereign power to deal with its own commerce, using its own canal in whatsoever manner it saw fit. The president argues that if there is nothing in the Hay-Pauncefote treaty preventing Great Britain and other nations from extending favors to their shipping using the canal and if there is nothing that gives the United States any supervision over or right to complain of such action, then the British protest leads to the absurd conclusion that this government in constructing the canal, maintaining the canal, and defending the canal, finds itself shorn of its right to deal with its own commerce in its own way, while other nations using the canal in competition with American commerce enjoy that right and power unimpaired.

It is absolutely beyond our power of reasoning to discover what possible basis there can be for the British protest against allowing American ships engaged in coastwise service to pass through the canal free. There are no other ships than American ships engaged in this service. It is a purely domestic problem with which no nation has any concern whatever. However, Great Britain is very much wrought up over the subject if its periodicals, which are publishing reams of matter on the subject, are to be believed. To our way of thinking, the only sensible thing we have read on the subject in a British paper is the following from *The Nation*:

"America as a protectionist country has stringent navigation laws. No foreign ship is allowed to engage in coastwise traffic between American ports and moreover her courts have given the widest interpretation to the term 'coastwise traffic'. All this had obvious bearing on the Hay-Pauncefote treaty. Its provisions for equality of treatment could not apply to vessels engaged in coastwise service and using the canal, because only American vessels in fact were so engaged. *If the treaty meant that American ships which enjoy the monopoly under the navigation laws when plying around Cape Horn between the eastern and western coasts of America should lose that monopoly when they used the canal, it should certainly have said so, but no one ever suggested that the treaty suspends the operation of the navigation laws when the coasting trade goes through the canal.*

"The greater discrimination includes the less and as the navigation laws exclude all but American ships from the coasting trade, the grievance of discrimina-

tion in tolls upon coastwise traffic would seem to be somewhat unreal. If American ships had a monopoly of coastwise traffic when they went around Cape Horn they will have it when they go through the canal, whether or not the canal were American property and whether or not it ran through American territory."

The italics are ours. Certainly no one ever suggested that the treaty suspends the operation of our navigation laws and that view of it alone ought to settle all controversy.

In our opinion, the provision excluding ships owned in part by the railroads from the use of the canal is unwise. It would seem as though the powers of the Interstate Commerce Commission are sufficient to prevent any discrimination in rates against independent water carriers. Moreover, it is to be presumed that the Canadian Pacific and the Grand Trunk Pacific vessels may pass through, as it would be scarcely within our jurisdiction to legislate for other nations.

It is not likely that the provision admitting foreign-built ships to American register when owned by Americans will be taken advantage of to any extent. They could not enter the coastwise trade and their operating costs would naturally be higher under the American flag than under any other flag. The American ship builders protested against the provision, but the president did not think much of it and apparently for that reason.

The canal will be opened to traffic in September, 1913, and the bill at any rate outlines a plan to prepare for the event.

Motor Lifeboats for Ships

There can be no doubt that Lord Mersey's recommendations that the British Board of Trade shall be empowered to direct that one or more of the boats to be carried by ships shall be fitted with some form of mechanical propulsion, will give yet another filip to the motor boat industry. Time and again it has been seen how useful one or more motor lifeboats would be on board passenger liners in cases of emergency. And there is really no reason why an equally useful sphere of operations should not lie before craft of this type in connection with ocean-going cargo steamers. Indeed it is almost impossible to limit the field.

In the case of the Titanic it can well be understood that power boats would have proved of great service in towing other boats away from the sinking ship. Again such a craft, being of considerable power and weight, would almost certainly have been able to rescue many of those who, when the Titanic sank, were left to perish, simply because those in the lifeboats of the ordinary type were afraid to go back to succor drowning people, lest their craft should be overturned.

In the ordinary case of abandonment at sea the motor lifeboat would be sure to demonstrate its undoubted practicability. Suppose, for instance, a ship is abandoned some 300 or 400 miles from shore, and all on board are able to leave her in the boats. If her equipment includes a powerful motor boat, this craft will be able to tow all the boats towards the land. Again, should a ship founder in a stretch of ocean which is some distance from the recognized trade routes, the motor boat could take herself and the rest of the boats to a position where there was more probability of a passing steamer being sighted. While Lord Mersey does not in so many words recommend motor boats, he uses the phrase "fitted with some kind of mechanical propulsion". That, however, can only mean motor boats, for the steam launch could not in a case of sudden disaster be brought into service with the same expedition as the quick-starting motor boat. Such a craft, of course, will need to be carefully looked after by the officers of the ship, but on passenger liners it may be assumed that the strictest orders would be issued from headquarters in regard to the manner in which the efficiency of the motor boat or boats is to be maintained. As a matter of fact, some liners are already using motor craft with excellent results. Lord Mersey's recommendations foreshadow a big demand for motor lifeboats for liners, while it is also possible that cargo steamers will in ever-increasing degree realize their value.

Large Floating Docks

Owing to the recent departure of two large floating docks from ship yards at Barrow and Birkenhead for Montreal and Portsmouth, respectively, there has been aroused a good deal of public interest in floating docks. There has, however, been some confusion as to the size of these docks, one of which has been described as being the largest in the world, which is not correct. The new floating dock at Portsmouth for the admiralty is of just the same size and design as that built by Messrs. Swan, Hunter & Wigham Richardson, Ltd., Wallsend, for the British admiralty, and sent to the river Medway this summer. These twin floating docks, designed to lift battleships up to 32,000 tons displacement, are the largest yet built or owned in Great Britain, but still larger are the 40,000-ton floating dock, owned by the German government at Kiel, and the 35,000-ton dock belonging to Messrs. Blohm & Voss at Hamburg.

PARTICULARS OF SOME OF THE LARGEST FLOATING DOCKS IN THE WORLD.

Dock.	Lifting capacity. Tons.	Length. Ft.	Clear width. Ft.	Depth over keel blocks. Ft.	Owners.
Kiel	40,000	656	154	35¼	German government.
Hamburg	35,000	720	108½	33	Blohm & Voss.
Medway	32,000	680	113	36	British admiralty.
Portsmouth ...	32,000	680	113	36	British admiralty.
Montreal	25,000	600	100	27½	Canadian Vickers Ltd.
Hamburg	25,000	525¾	108½	33	Vulcan Company.
Pola	22,500	584¾	111½	37	Austro-Hung'r'n govt.
Rio de Janeiro	22,000	550	100	30	Brazilian govt.
Hamburg	20,000	511¼	97	26	Reiherstieg Co.

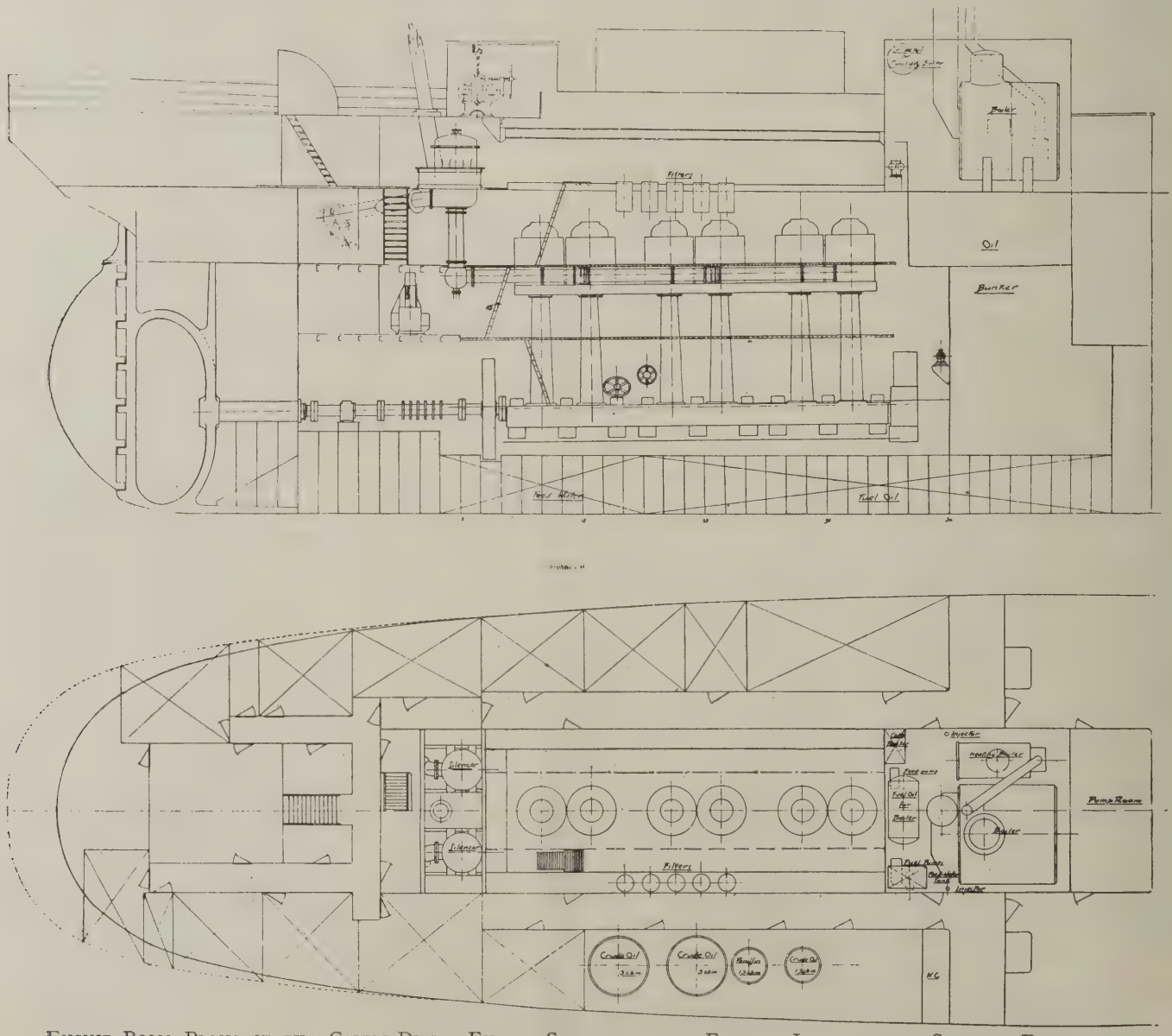
It is astonishing what a volume of business this country is doing, considering the fact that it is a presidential year. Gone are the days when politics disturbed business.

The Carels-Diesel Engine

The Two-Cycle Diesel Engine as Developed by Messrs. Carels—Its Advantages Enumerated

Although there are at present so many builders of Diesel engines, the actual number of types constructed is relatively small, and among these the Carels design will always have a prominent place—more than could possibly be the case were the Carels-Diesel engine built only by the Ghent firm themselves. This is due to the fact that licenses for construction have been granted to many engine builders in all parts of Europe, among whom are such well known firms as Vickers, of Barrow; Richardsons, Westgarth & Co., of Middlesbrough; the Clyde Shipbuilding & Engineering Co., Port Glasgow; Messrs. Stephen & Sons, Glasgow. In Germany, the Reiherstieg Schiffwerfte und Maschinenfabrik, of Hamburg, and J. C. Teckelenborg, A. G., of Bremerhaven, work in connection with Messrs. Carels, as do Schneider et Cie, of Le Creusot, in France. It is not difficult to anticipate that these important firms will in the future years of the rapid development of the Diesel engine produce such a number of motors as will serve as a great monument of the enterprise of the Belgian firms.

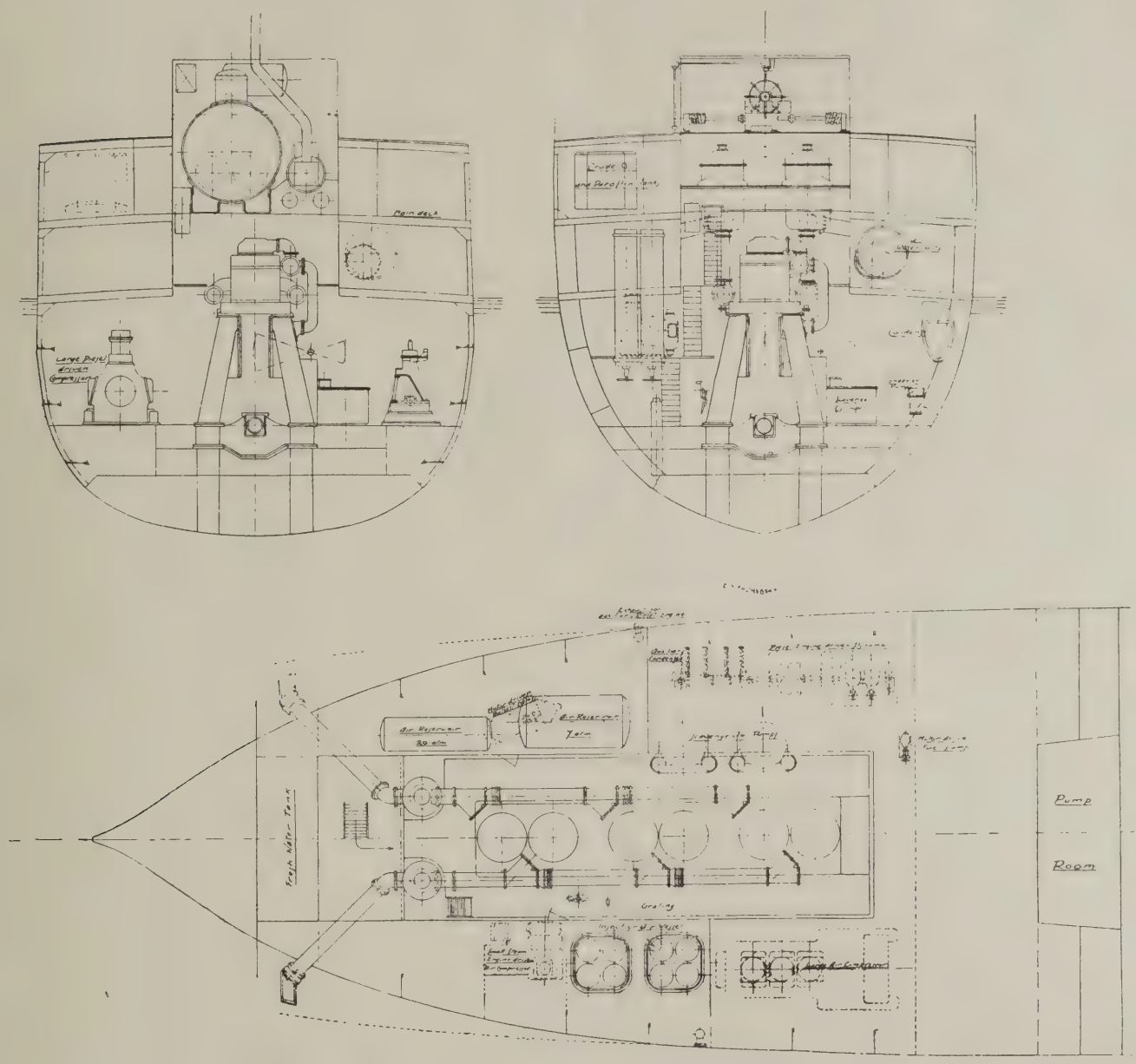
The two-cycle Diesel marine engine, as developed and at present constructed by Messrs. Carels, differs considerably from all other types. Our illustration shows a four-cylinder motor designed for 800 B. H. P. to 1,000 B. H. P., and of this type at least four have been already constructed for marine work. The bedplate is in halves, and the cylinders are supported separately by columns, which are flanged and bolted together to form a rigid frame in the manner shown, the feet cast on to the cylinders being bolted direct to broad flanges on top of the columns. The columns on the port side of the ship carry the crosshead guides, which are flat, and it may, incidentally, be mentioned that apart from the reversing



Engine Room Plans of the Carels-Diesel Engine Similar to the Engines Installed in Steamer Eavestone

arrangements, this is the only material point of difference in the marine engine from land engines of similar type which Messrs. Carels are constructing, the guides in this case being curved. All marine engines now built by this firm are of the crosshead type, and it seems inevitable that such a design will be generally adopted, except possibly for cylinder, opposite the exhaust ports. Messrs. Carels belong to the former category, being of the opinion that such efficient scavenging can never be obtained by the employment of the ports. The contention as to the completeness of the scavenging effect with valves is beyond question, although the advantage in a marine engine of the omission of so many All these valves, except the safety valves, are controlled by levers, and actuated by cams in a somewhat similar manner to the working of the valves in the ordinary four-cycle land engine.

Perhaps in no detail of the design of marine Diesel engines is there so much variation as in the reversing gear and its method of operation;



ENGINE ROOM PLANS OF THE CARELS-DIESEL ENGINE SIMILAR TO THE ENGINES INSTALLED IN STEAMER EAVESTONE

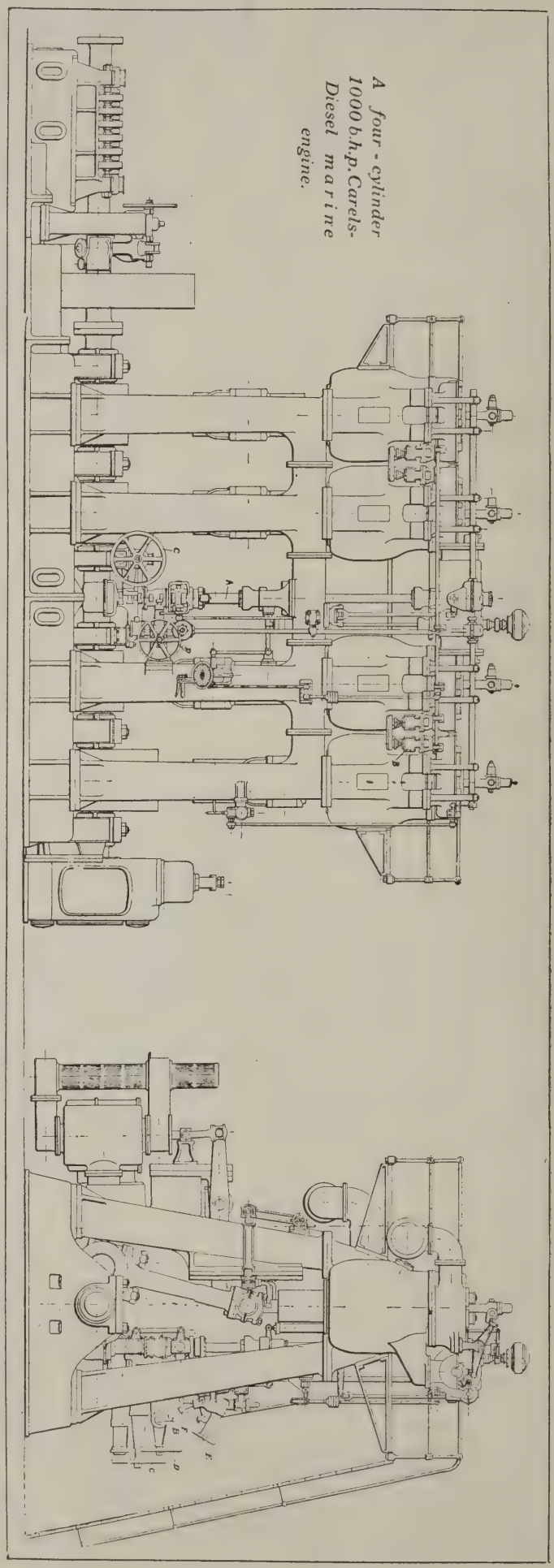
the high-speed motor, which will always have some vogue, particularly for submarine engines.

The question of the most suitable method of supplying the scavenge air for two-cycle engines is one which has up to now by no means been finally decided. Several firms adhere to the original arrangement of admitting it through valves in the cylinder cover, whilst others prefer to adopt ports in the bottom of the valves as possible cannot be denied, and we understand that the Diesel Engine Co., of London, are now perfecting a design in which both ports and valves are used for the admission of scavenge air. In the engine now being described, four scavenge valves are provided for each cylinder, being arranged symmetrically in the cover, with a fuel valve in the center, whilst there is also a starting valve and a safety valve for each cylinder. this is an extremely good sign, inasmuch as it indicates that there are many very satisfactory arrangements, and there is little doubt that the troubles anticipated on this score have been very much exaggerated. When scavenge valves and not ports are provided, it has been usual to operate these from cams on the same shaft as those for the fuel and starting valves, and for reversing to have two separate cams for operating each valve,

according as the engine is running in the ahead or astern direction. In some designs, reversing is accomplished by employing only one cam for the scavenge air valve, and one for the fuel inlet valve, and arranging the setting of these cams so that by turning the camshaft through a certain angle, relative to the crankshaft, the cams are brought into the required position, but in that case special arrangements must be made for the starting air-inlet valves. If two cams are provided for each valve, and the camshaft is moved longitudinally for reversing, some difficulty arises with the scavenge valve, owing to the presence of compressed air in one or two of the cylinders when the engine stops, and it is evident that a single cam is sufficient for actuating the scavenge air-inlet valve, provided the shaft on which it is mounted is turned through the requisite angle.

Features of Carels Design

In the design adopted by Messrs. Carels, the camshaft is capable of turning through an angle relative to the crankshaft, so that the scavenge valves are set in the position for astern running, and by this means only one scavenge valve is required per cylinder. For the starting and fuel inlet valves, two separate cams, side by side, are provided for each cylinder, and to bring the astern set into action another shaft, directly in front of the camshaft, is moved in a longitudinal direction. This causes the rollers of the fuel and starting valve levers to take up positions above the astern set of cams, on the camshaft, the operation being effected by means of the intermediary levers. The camshaft is driven in a manner similar to that adopted in land engines from the crankshaft, by means of spiral gearing, and the vertical shaft *A*. An ingenious and simple method is adopted of rotating the camshaft relative to the crankshaft, this being accomplished merely by raising the vertical spindle *A*, which is provided with a sort of sleeve coupling. This movement is effected by a small air motor, which is controlled by the lever *B*, whilst in the case of failure of the air motor the operation can be carried out by hand by the wheel *C*. The hand wheel *D* is interlocked with the gear for rotating the camshaft, and can only be moved when this is properly set, and it serves as the maneuvering wheel for starting up the engine and reversing. On turning this hand wheel when requiring to run astern, after shutting off fuel admission, compressed air is first introduced, the motor thus rapidly



A four-cylinder 1000 b.h.p. Carels-Diesel marine engine.

A FOUR-CYLINDER, 1,000 B. H. P., CARELS-DIESEL MARINE ENGINE

coming to rest, after which it runs up in the reverse direction as an air engine, all cylinders being in operation. The exact arrangement of the fuel admission, which follows, depends on the number of cylinders, but, generally speaking, by a further rotation of the hand wheel *D*, the cylinders are successively supplied with fuel, and admission of starting air is gradually cut off until all the cylinders are running on fuel, the supply of which is gradually augmented until full speed is attained. The whole of this process is rapidly and easily carried out by the hand wheel *D*. The wheel *E* is employed for varying the speed of the engine, by controlling the setting of the governors as required.

The scavenge cylinders, of which there are two in the four-cylinder engine, are of the double-acting type, and their arrangement, as seen in the illustration, differs from that generally adopted in marine Diesel engines. By this method the length of the engine is reduced as compared with design in which the scavenge cylinders are mounted on the bedplate at the end of the working cylinders. In this engine, piston valves are employed for the scavenge pumps, the scavenge cylinder and valve chamber being cast in one piece.

Arrangement of Exhaust Ports

The exhaust ports in the bottom of the cylinders are arranged around the whole circumference, and lead to an annular chamber to which the exhaust pipe is connected. In view of the possibility of exhaust gases leaking past the piston, which is fitted with Ramsbottom rings, a stuffing box is arranged at the bottom of the cylinder, from the center of which any exhaust gas is drawn off to the inlet side of the scavenge pumps, so that no leakage into the atmosphere is likely to occur.

The cylinder cover containing all the valves is of cast steel. The pistons are water-cooled, and it will be interesting to watch developments in this direction, as in some quarters the employment of oil as a cooling medium was originally preferred. The cylinder jackets are water-cooled in the usual way, and mud doors are provided for cleaning purposes, and in this engine the cooling spaces are of specially liberal dimensions—a precaution which is particularly desirable for two-cycle motors. The main fuel oil pumps, of which there is one for each cylinder, are driven off the camshaft, and the governor regulates the distribution of oil in the usual manner, by acting on the suction valves of the pumps. The amount of oil entering the cylinders is also capable of regulation, by means of the small lever *F* seen in the illustration.

The main injection and starting air supply is provided from a three-stage Reavell-type compressor, driven off the end of the crankshaft, whilst at the other end is a large but not particularly heavy flywheel. The compressor is of ample capacity, and is sufficient for the provision of air for all ordinary maneuvering requirements.

The Reiherstieg Engine

One of the first firms to take up the construction of Diesel marine engines, in conjunction with Messrs. Carels, was the Reiherstieg Schiffwerfte und Machinenfabrik of Hamburg, and an engine of about 1,800 H. P. to 2,000 H. P. has been recently built with the co-operation of both firms. It was intended to install this in an existing steam-propelled vessel, the Excelsior, but the owners were unable to lay up the vessel and take out the steam plant, owing to the trade being so busy, and hence a new ship of 7,500 tons dead weight is being constructed and will soon be launched at Hamburg, this being for the German-American Petroleum Co.

The plans which we give are those adopted for the replacement of the steam plant in the Excelsior by Diesel engines, but in the new vessel the arrangements shown will not be materially modified, and where alterations are made they will be beneficial, as naturally it is easier to adapt the general arrangement to a new vessel.

The engine is of a Carels type, following on the lines of the one already described in practically every important detail. There are, however, six cylinders instead of four, arranged in three pairs, and the crankshaft is in three parts, each of exactly the same length, namely, about 12 ft., the diameter being about 14½ in. The advantage of such a construction lies in the fact that only one spare length need be carried. The scavenge pumps are driven by levers from the connecting rods, and each pump is of capacity well in excess of the requirements of three cylinders, so that in the event of breakdown of one scavenge pump, the engine could still run at half-load or over. The diameter of the cylinders is 600 mm. (23⅝ in.) and the stroke 1,100 mm. (43⅜ in.), the maximum speed of the engine for full vessel speed being 100 R. P. M., thus nearly conforming with standard marine-steam-engine practice. It may be interesting to give the overall dimensions of the motor, which are greater than might have been anticipated, owing to the arrangement adopted. The overall length, including the bearings, is about 46 ft. 3 in., the width 17 ft. 5 in., and the total height 23 ft. 6 in.

The weight of the engine itself is just under 300 tons, whilst the auxiliaries are about 220 tons, giving a total weight of machinery of some 520 tons. This is seemingly rather high, and is probably not much less than a corresponding steam-engine equipment. In view of the original intention of the owners to install the motor in an existing vessel, there was, however, but little to be gained in any diminution of weights, and it is, we understand, for this reason that the weight works out at such a relatively high figure. The flywheel is 9 ft. 10 in. in diameter, and its weight is 10 tons, the thrust block, with six collars, being placed just aft of the flywheel. Ring lubrication is provided for the main bearings, whilst for the pistons forced lubrication is adopted.

Engine Exhaustively Tested

The engine has run for some considerable time at the works of the Reiherstieg Co., and has been very carefully and exhaustively tested, whilst inspections have been made by many interested parties, including representatives of the British admiralty. All who have seen it in operation agree that it runs very smoothly and with little vibration, whilst the regulation and reversing are effected with great ease. We understand that the fuel-consumption tests have been satisfactory, he result being that about 0.45 lb. of oil is required per B. H. P. hour at full load. The economy in fuel should therefore be considerable, and there will be a reduction of about 40 per cent in the staff required, as compared with a similar steam ship.

Coming to the general arrangement of the machinery and auxiliaries, a small oil-fired boiler is provided for power purposes, whilst there is a smaller boiler for steam heating, when the first boiler is out of operation. A steam engine, placed well above the engine-room floor, is coupled direct to a compressor, which supplies the compressed air when required for the three-cylinder Diesel engine driving the auxiliary compressor, and this delivers the air to the main engines for starting-up purposes. Both these auxiliaries are very rarely required to be put into operation, since the main compressor, in combination with the air reser-

voirs, is usually sufficient. This main compressor is of the Reavell type, and is driven direct off the main engine in the ordinary manner. The dynamo for the ship's lighting, etc., is driven direct by a four-cycle Diesel engine, this dynamo also providing the electric power for one or two motors, the ballast pump, the oil pump for the main engine, and that for the boiler, all being electrically operated. Two air reservoirs are provided, one of about 80 cu. ft. capacity for a pressure of about 290 lb. to 300 lb. per sq. in., and the other of about 200 cu. ft. capacity for a pressure of 100 lb. per sq. in. For the sake of economy, and to avoid running the donkey boiler more than necessary, the steering engine is operated by compressed air when the ship is at sea, but is driven by steam when near land, whilst there is a larger oil pump, also steam driven, this only being occasionally required.

First British Owned Diesel Engined Ship

Messrs. Furness, Withy & Co.'s new Diesel-engined ship Eavestone has carried out her preliminary trials, and, judging from results attained, the builders and engineers, Messrs. Richardson, Westgarth & Co., Middlesborough, have turned out in her a big success. The Eavestone is a vessel of 3,600 tons dead weight carrying capacity, and is 276 ft. in length by 40 ft. 6 in. molded beam. She is the first really large British-owned Diesel ship to be built, and accordingly a vessel to which the greatest interest is attached. Her engines take the form of a four-cylinder two-stroke set made by the well known Middlesborough firm under license from Messrs. Carels Freres, of Ghent. The service speed of the engines is only 115 R. P. M., which allows of splendid propeller efficiency and at this speed over 850 B. H. P. is developed. This Carels engine of the Eavestone is practically a duplicate of the 850-H. P. Carels engine just completed by the Clyde Shipbuilding & Engineering Co., Port Glasgow, for the American Lakes vessel Fordonian, which they recently launched, and is an engine of simple construction and not at all unlike the usual steam reciprocating installation. In the Carels Diesel engine there is the open crank pit, the box columns giving support to the cylinders, and the open crossheads working the air scavenging pumps in similar fashion to the air pumps on a steam engine. During the trials of the Eavestone the engines were kept running at full load for over nine hours, during which time no trouble of any kind was experienced, the fuel used being heavy residue oil.

No type of oil engine is commanding more attention in Britain for big ship propulsion than the Carels; indeed, at the present time the majority of motor ocean-going vessels under construction are to be so fitted.

As compared with a sister ship driven by steam engines, the extra space avavilable for cargo on a 30 days' trip amounts to no less than 400 tons.

It is hoped that, in due course, a special trip will be arranged when those interested in the advent of the first British-owned oil-engined ship will have an opportunity of inspecting in London the latest design of Diesel marine engine.

The Eavestone took a cargo of coal from West Hartlepool, England, to Antwerp on her maiden trip. During the run of 37½ hours no trouble developed; there were no stops and no heat in the engine room. The Eavestone returned to West Hartlepool light against heavy head winds and without a stop. The governor was set for 86 R. P. M., and when the propeller was thrown out of the water the maximum speed was 92 revolutions, coming back to 86 revolutions in less than five seconds.

Carels-Diesel Ship for Great Lakes

Considerable interest was evinced in the launch on July 3 from the yard of the Clyde Shipbuilding & Engineering Co., Port Glasgow, of the motor-driven ship Fordonian, intended for passenger and cargo service on the Great Lakes of America. This packet-freight steamer, which is the first of her type to be constructed in the Greenock district, is of the following dimensions: Length, 250 ft.; breadth, 42 ft. 8 in.; depth molded, 16 ft. 10 in. to the main deck, and 26 ft. 6 in. to the awning deck. She is thus an ordinary type of vessel, but her engines are, however, very interesting, and on this particular point she is a vessel of no small importance. Unlike the twin-screw motor liner Jutlandia, built and engined by Messrs. Barclay, Curle & Co., Whiteinch, the Fordonian is a single screw ship, and is not fitted with four-cycle engines, as was the case with the Whiteinch vessel, but has an 800 B. H. P. four-cylinder Carels-Diesel two-cycle set. Each of the 8-cylinder twin Burmeister and Wain engines of the Jutlandia developed 1,270 H. P., or about 160 horsepower per cylinder. The Fordonian's engines, however, are designed for 200 B. H. P. per cylinder, and will no doubt give more, and are, therefore, built up of the highest-powered units yet seen in the British marine heavy oil engine. In some quarters it was said that the engines of the Fordonian were being built by Messrs. Carels Freres at Ghent. This is not the case, and all the credit goes to the Port Glasgow firm as with the exception of the cylinders, which were cast and bored at Messrs. Carels' works, the machinery was turned out complete by the Clyde company.

The Fordonian has been built under Lloyd's survey. A noticeable feature of the design of oil motor-driven vessels is that the machinery space is only about one-third of that which is necessary for steam engines, and the absence of boilers and boiler casings leaves a large amount of hold space for the cargo, and for more deck space for the use of passengers than would be possible with steam engines. A motor ship has also considerable advantages over the equivalent steamship; there is more economy in fuel in the former type of vessel, while she requires no stokers or coaling, and there are no stand-by losses when not under way, and no discharge of ashes, and an important matter for passengers and cargo is the absence of heat. A most important fact is that the Fordonian will have a radius of navigation on the same bunker capacity of at least four times that of steam and she will be able to effect an immediate starting against a 24 to 30 hours' delay in getting up steam.

Large Carels Marine Diesel Engine

Editor MARINE REVIEW:—On Saturday, July 29, the writer visited the works of the Reiherstieg Schiffswerfte und Maschinenfabrik, Hamburg. I saw the six-cylinder 1,800 H. P. Carels marine setting on frame work and not at all bolted. This engine had been idle for several days when the writer witnessed their opening the valves, preparing the lubricating and circulating systems, and by a small turn of the hand on the operating lever, this massive engine started and went to its full speed in less than 5 seconds.

The operator, still standing in the same position, reversed the engine from full speed ahead to full speed astern in 9 seconds, he, then, by still handling the same lever maneuvered the engine for a wide range of speeds with great ease.

The engine is self-contained, the injection air compressor is connected to the fore-end of the engine, where the scavenging air cylinders, the cir-

culating water pumps, the bilge pumps and an air cylinder, which will develop air for maneuvering the ship, are all connected to back of the engine frame and operate by levers from the connecting rods. This makes a compact arrangement and works very successfully. This simplicity of the water pumps and air pumps I consider a great attainment in the application of the Diesel engine to marine service.

The temperature created by the operation of the engines is hardly perceptible on the outside of the engine, as they circulate the necessary volume of water to keep all parts, including valve cages, perfectly cool. They have a mechanism of pumps attached to each piston which circulates through the inside of the piston to keep it cool. This is a piston pump positive in its action and having no flexible joints or parts liable to get out of working order.

The lubricating of the engine is very positive and successful.

The reversing of the engine is simple and all on the outside is subject to a minute inspection at any time when the engine is in operation. When in operation, this 1,800 H. P. engine creates so little noise in the engine room that it can be considered almost silent, as the operators can talk to each other in a normal tone without any difficulty.

The writer was surprised at the lack of vibration in this engine when operating under various loads and reversing; as stated above, the engine was not anchored to the foundation or solid matter that would tend to eliminate the vibration, but its bed-plate was simply resting on I-beams, lying on the shop floor.

The design of the engine is exactly that of a standard marine steam engine with large cast iron columns resting on a heavy base, the shaft and main bearings, the connecting rods with both crank and piston bearings are exactly marine practice. In fact in the same shop there was being assembled a large quadruple expansion steam engine, which to the layman would appear to be the same in every respect as the large Diesel engine with the exception of the working of the valves and rods.

The object of the builders appears to have been to build a marine Diesel engine as near like a marine steam engine as possible, and they have certainly succeeded well.

This two-cycle marine type Carels engine is far superior to the four-cycle type marine engine, especially in the feature that it is an open frame, simple in design as compared with the other being a closed case with many complications in the working parts subject to getting out of working order.

This engine is seriously worth all consideration by all builders of ships at this time.

The engine has been developed in a range of sizes and can be made in 4, 6 and 8 cylinders as desired.

W. R. HAYNIE.

Steamer Thompson Leaves for Coast

The steamer Robert M. Thompson, the first of three ships building by the Great Lakes Engineering Works, of Detroit, Mich., from designs by and under the supervision of Theodore E. Ferris, naval architect and engineer, of New York, for the American Transportation Co., J. W. Elwell & Co., agents, left for the coast during the past month after completing a series of trials on Lake St. Clair, to the satisfaction of both builders and owners. Her sister ships, the A. A. Raven and Ruby, will follow in a month or six weeks. The vessels are the most modern of freight carriers, having a double bottom, 'tween decks, cargo ports with excellent cargo handling facilities. Their dimensions are 261 ft. over all; 241 ft. keel; 43 ft. 6 in. beam, and 29 ft. deep, having carrying capacity for 4,000 tons on deep sea draught. The engines are triple-expansion 21½, 35½, 58 in. cylinder diameters by 42 in. stroke, supplied with steam from two Scotch boilers 14 ft. 2 in. diameter and 12 ft. long, fitted with forced draught.

The Thompson was given quite an ovation as she proceeded to the coast and she was royally received upon her arrival at New York. The South Brooklyn piers were decorated in her honor and a banquet was given aboard her, which was presided over by D. H. E. Jones, who was directly responsible for the organization of the new company. Mr. Jones related that he had always been keen to own an American-built vessel to engage in foreign trade. It is the intention to operate the new fleet under the American flag to Mediterranean ports. J. W. Elwell & Co. have long operated vessels in the foreign trade under foreign flags. However, the Thompson is the first to fly the Stars and Stripes.

"The freight market is so good," said Mr. Jones, "that steamers flying the American flag can compete with foreign carriers to foreign ports at a profit. I expect this condition to continue for some time. There is a great scarcity of tonnage, both here and abroad, and English as well as German shipyards are crowded with orders. The coming year will witness an immense increase in America's little merchant marine.

"When the Robt. Thompson sails in September for the Mediterranean, she will be the first American ship to enter that trade route for 35 years, when foreign competition drove us away. The ships we have operated since, have been French vessels with French officers and crew. Those we have built on the Great Lakes will fly the Stars and Stripes and will be commanded by American captains and manned by an American crew."

Another Unloading Record

Unloading records are following fast upon each other at Conneaut. One is no sooner established than it gives place to another. The records made on the Palmer and Morgan as chronicled in the August issue of THE MARINE REVIEW, were broken by the steamer P. A. B. Widener on Aug. 8, when 10,636 gross tons of Pioneer ore were discharged in two hours and 50 minutes. It is significant also that the entire cargo of the Widener was loaded into cars. It can be appreciated from this that very efficient car service is necessary to prevent delays at the unloaders when the ore is being lifted from the hold of a vessel at such a rate. The Widener began unloading at 2:20 P. M. and finished at 5:10 P. M., the elapsed time being 2 hours and 50 minutes. The details of the unloading follow:

	Tons per hour.
For nine machines (gross ves. time).	3,754
For nine machines (gross mach. time)	3,847
For nine machines (net mach. time)	4,037
5,229 tons were unloaded by four Hulett steam machines.	
For one machine, gross time.....	482
For four machines, gross time.....	1,927
For one machine, net time.....	508
For four machines, net time.....	2,034
3,538 tons were unloaded by four Brown electric machines.	
For one machine, gross time.....	315
For four machines, gross time.....	1,260
For one machine, net time.....	336
For four machines, net time.....	1,344
1,869 tons were unloaded by Hulett electric machines, as follows:—	
Gross time	660
Net time	660

Lake Ship Building

Capt. John Mitchell has placed an order with the American Ship Building Co. for a bulk freighter to replace the James Gayley which was sunk in collision with the steamer Rensselaer 43 miles east of Manitou Island, Lake Superior, during a dense fog on Aug. 7. The Gayley was struck immediately abaft the forward deck house and sank in fifteen minutes in 600 ft. of water.

The new steamer ordered will be somewhat larger than the Gayley, being

545 ft. over all, 525 ft. keel, 58 ft. beam and 31 ft. deep, and will carry 10,000 gross tons. She will be built at the Lorain yard of the American Ship Building Co. and will be delivered next spring. She will be constructed on the Isherwood system and will have straight side tanks.

Following the practice to avoid litigation, if possible, the Pittsburgh Steamship Co. which owns the Rensselaer and the Cleveland Steamship Co. which owned the Gayley, have settled their differences upon an equal division of the damage. The Gayley was valued at $250,000.

The steamer George T. Warren, building for the Boston & Virginia Transportation Co., Boston, was launched at the yard of the Toledo Ship Building Co. on Aug. 21. The steamer is of Canadian canal dimensions and is intended for service on the coast.

The Great Lakes Engineering Works launched the steamer Ruby for the American Transportation Co. of New York on Aug. 21. This steamer is also of Canadian Canal dimensions and is intended for coastwise service. She is the last of the three steamers building for this company to be launched.

The 600-ft. steamers building by the American Ship Building Co. for the Pittsburgh Steamship Co. will be named James A. Farrell, Percival Roberts, and Richard Trimble. The Farrell will go overboard at Lorain on Sept. 28.

The steamers E. A. S. Clarke and William E. Reis, managed by Capt. John Mitchell of Cleveland, are being remodeled at the yard of the Toledo Ship Building Co. They will be given side tanks and 12 ft. center hatches after modern practice.

First Automatic Unloading

The loss of the steamer James Gayley on Lake Superior last month recalls the fact that it was the maiden trip of the Gayley that marked the coming together, so to speak, of the modern ore unloader with the modern type of vessel constructed especially for automatic unloading. James Gayley, at that time vice president of the United States Steel Corporation, in whose honor the steamer was named, had manifested a keen interest in ore transportation facilities and in loading and unloading docks and it was his suggestion that 'tween deck beams and stanchions were eliminated or their use greatly minimized in the construction of the Gayley. The merit of the new construction was demonstrated when the Gayley unloaded her maiden cargo, 95 per cent of it being automatically unloaded. The Gayley on that occasion carried 6,088 gross tons and unloaded on May 27, 1902, at the Hulett 10-ton unloading plant at Conneaut. There was considerable opposition to the design at the time. Within two years thereafter practically all bulk freighters on the lakes were being built with 'tween deck beams and hold stanchions entirely eliminated, and with the further advantage of having their hatches space 12 ft. centers instead of 24 ft. centers. This rapid change was brought about by the practical demonstration by the Gayley that her ore cargo could be automatically discharged without a man in the hold of the ship.

Lake Trade

The lake situation is better than it has been at any time during the past three years. The trade is apparently booked for one of its old time finishes with everyone eager for tonnage and paying good prices to get it. The movement of ore, as will be noted in the ore shipments elsewhere, is the heaviest on record and while it has been almost exclusively carried in contract ships, ore shippers could nevertheless employ additional tonnage if they could get it. The grain rate, however, is working out at quite an attractive figure so that vessel owners are quite reluctant to take any additional ore at the established contract rate of 40 cents. Of course, it is probably true that large ore shippers could get tonnage at the contract rate if they wanted to, but the smaller ore shipper cannot. In fact, a Buffalo concern has been trying to get tonnage for some little time at an advance of 10 cents without any takers. The reason is that the grain rate is extremely attractive, working out during the first half of September at 93 cents on ore and calculated to go considerably higher. In fact, it is predicted that by October 1 the grain rate will be equivalent to $1.20 on ore. Practically all vessels are employed and there appears to be

STEAMER JAMES GAYLEY DISCHARGING MAIDEN CARGO (6,088 GROSS TONS) OF IRON ORE MAY 27, 1902, AT AUTOMATIC UNLOADERS, CONNEAUT, O.; 95 PER CENT AUTOMATICALLY UNLOADED

plenty of business for everyone. This is indeed in strange contrast to the experiences of the past three years when vessels had to go into voluntary retirement early in the year and some in fact were not operated at all during the entire season.

A contributing reason has been the continued thick weather. Practically the whole of August was one of fog and all vessels were delayed. As an offset to this is the incredible efficiency of the unloading machine. When 10,600 tons can be taken out of the hold of a steamer in less than three hours and loaded into cars, dispatch may be said to have reached its maximum, but as a matter of fact, records are being broken all the time.

Commerce of Lake Superior

The commerce of Lake Superior for August as measured by the canals at Sault Ste. Marie was the heaviest of the year, reaching 10,852,852 tons as against 10,781,504 tons for July and 10,747,159 tons for June. The movement to Sept. 1 of the present year totals 41,484,926, as against 31,488,323 for 1911, and 40,046,800 for 1910, a gain of 1,438,126 tons over the record movement of 1910. Following is the summary:

East Bound.	To Sept. 1, 1911.	To Sept. 1, 1912.
Copper, net tons	71,078	60,772
Grain, other than wheat bushels	18,418,257	25,046,811
Building stone, net tons	4,137	2,282
Flour, barrels	3,454,630	4,029,959
Iron ore, net tons	18,683,240	27,749,944
Pig iron, net tons	17,784	11,974
Lumber, M. ft. B. M.	328,329	387,691
Wheat, bushels	34,078,649	60,866,933
Unclassified freight, net tons	79,453	128,196
Passengers, number	30,276	25,264
West Bound.		
Coal, anthracite, net tons	1,226,515	926,926
Coal, bituminous, net tons	8,116,034	8,063,394
Flour, barrels	125	.....
Grain, bushels	1,100	100
Manufactured iron, net tons	242,900	366,989
Iron, ore, net tons	12,622	3,188
Salt, barrels	382,826	405,742
Unclassified freight, net tons	732,632	748,628
Passengers, number	35,130	27,533
Summary of Total Movement.		
East bound, net tons	21,100,586	31,315,627
West bound, net tons	10,387,737	10,169,299
Total	31,488,323	41,484,926

The total number of passages to Sept. 1, 1912, was 13,330, and the net registered tonnage, 32,896,057.

August Ore Shipments

Ore shipments during August amounted to 7,760,248 gross tons, the highest record of the year, and making the third month in which the 7,000,000-ton mark has been exceeded. During June last the fleet moved 7,600,283 tons, in July 7,567,555 tons, and as stated, in August 7,760,248 tons. This movement was carried practically in contract ships, though the ore shippers would have been glad to charter more wild tonnage, if possible. However, the grain trade has been so attractive that there is little outside tonnage to be had. The movement to Sept. 1, is 29,051,152 tons as against 19,606,068 tons to Sept. 1, 1911, an increase of 9,445,084 tons. The August movement marks the passing of the 1910 record when up to Sept. 1, 28,827,029 tons were moved during that year. The increase over 1910 to Sept. 1 is therefore 224,123 tons.

Following is the summary by ports:

Port.	August, 1911.	August, 1912.
Escanaba	706,445	761,717
Marquette	357,571	570,586
Ashland	407,578	761.539
Superior	1,689,952	2,397,535
Duluth	1,211,667	1,690,650
Two Harbors	1,175,098	1,578,221
Total	5,548,311	7,760 248
1912 increase		2,211,937

Port.	To Sept. 1, 1911.	To Sept. 1, 1912.
Escanaba	2,418,251	3,240 011
Marquette	1,200,748	2,031,400
Ashland	1,509.841	2,865,397
Superior	6,382,273	9,066,190
Duluth	4,370.117	6,076,452
Two Harbors	3,724,838	5,801,702
Total	19,606,068	29,051.152
1912 increase		9,445,084

Lake Ore Receipts

Out of total ore shipments of 7,760,248 gross tons during August, Lake Erie ports received 6,075,673 tons, distributed as follows:

Port.	Gross tons.
Buffalo	802.367
Erie	62 274
Conneaut	1,303,982
Ashtabula	1,305,840
Fairport	375.373
Cleveland	1,291,831
Lorain	637,388
Huron	78,100
Sandusky	.....
Toledo	141,145
Detroit	77,373
Total	6,075,673

Floating Dry Dock at Toronto

The Polson Dry Dock & Shipbuilding Co. Ltd., of Toronto, has begun the construction of the first steel floating dry dock built in Canada. The dock will be located at the foot of Sherbourne street, and will be of the sectional "U" type, and was designed by William Newman, works manager. The plans have been approved by the Canadian government, by which the work is liberally subsidized.

The dock is to be 330 ft. long by 100 ft. wide and 35 ft. 4 in. deep, and 72 ft. wide on deck, 88 ft. wide on top with 8 ft. 6 in. depth of hold, to be built in two sections of equal heights, weighing approximately 2,400 tons with a lifting capacity of 4,400 tons. The pumping equipment consists of twelve 12-ft. centrifugal pumps with a capacity of 42,000 gallons per minute, in batteries of three in each quarter of the dock, each battery driven by a 75-H. P. direct-connected motor and all pumps controlled from a central station ashore. The construction of the pumping equipment consists of one longitudinal water-tight bulkhead amidships and a transverse water-tight bulkhead every 50 ft., dividing the dock into twelve compartments each 50 ft. square with a pump in each. The discharge and flooding of the dock is all through one valve at each pump.

Germans on the Titanic Disaster

Cable dispatches announce that the commanders of German trans-Atlantic liners practically all agree that under similar circumstances with those obtaining at the time of the Titanic disaster they would not have reduced speed. They maintain that with a proper lookout there would be ample time to avoid a collision with ice. The German view is that Capt. Smith's lookout failed him.

The steamer William A. Rogers of the Niagara Transit Co.'s fleet was in collision with Standard Oil Co.'s barge No. 96 off Whitefish Point on Sept. 2 during a dense fog. The barge was being towed by the tug Security when the Rogers crossed the tow line, causing the barge to take a sheer into her. The Rogers returned to the Sault for an examination where it was found that her bow had been crushed in almost to the collision bulkhead. Her stern is also twisted and it will take about three weeks to repair her. She is now in dry dock at Superior.

The Montreal Transportation Co. through John Reid & Co. of Montreal have placed contract with Swan, Hunter & Wigham Richardson for a steamer for service on the great lakes to be electrically driven. She will be equipped with internal combustion oil engines connected to dynamos and the electric power thus generated will be transmitted through motors to the shaft.

The Homestead Valve Manufacturing Co., Homestead, Pa., recently issued catalog and price list of their complete line of valves. The catalog is very instructive, giving description of the various types of valves illustrated with sectional views.

The Kenyon Searchlight Co., formerly of Bedford, O., has reorganized with offices at Detroit, Mich. Its facilities are largely increased and it is now in position to meet all requirements for all styles of portable searchlights.

Naval Tugs Sonoma and Ontario

The New York Ship Building Co., Camden, N. J., has just completed for the United States navy department, the steel ocean-going tugs Sonoma and Ontario, ordered by the United States government, Aug. 24, 1911, and launched, the Ontario on April 11, 1912, and the Sonoma on May 11, 1912. These tugs are of the single-screw type and have the following dimensions: Length over all, 185 ft. 2 in.; length between perpendiculars (fore side of stem to after side of rudder post), 175 ft.; beam, molded, 34 ft.; beam, over guards, 35 ft. 6 in.; depth, molded, to main deck, 20 ft. 3 in.; mean load draught (salt water), 12 ft. 6 in.; speed, loaded, at sea, 14 knots.

The vessels are of open-hearth steel throughout, and built in accordance with the rules of the American bureau of shipping and under special survey. They are subdivided by seven watertight bulkheads, and have raked stem and elliptical stern, two masts with derrick boom of 5-ton capacity on fore mast, schooner rig and equipped with a wireless outfit. These tugs are very large and powerful, being well adapted for the work they will be called upon to do in the event of war.

Quarters for a naval complement of four officers, three chief petty officers and 35 men, are arranged as follows: Captain's quarters aft of the pilot house, officers' quarters in forward end of main deck house, crew on lower deck, forward; chief petty officers and engine room force on lower deck, aft; toilets, galley, etc., forward of engine space, in main deck house. There is fitted forward a steam windlass, combined with towing bitt, the windlass having warping ends. A reversible capstan is fitted on main deck aft. Two steam winches of 5-ton capacity each are located, one at fore mast on main deck, the other at the main mast on top of the deck house. A towing machine is provided in the after end of the main deck house and supplied with necessary hawser rollers, etc., a towing bitt is also fitted aft, a steam steering engine is located in engine room and has connection in pilot house. A combined steam and hand steering wheel is fitted on after end of deck house top.

The boat equipment consists of one 21-ft. motor dory, one 28-ft. whale boat and one 16-ft. dinghy; the former two being slung under davits. One 4-in. Monitor fire hose nozzle is fitted on top of pilot house and a similar one on top of deck house aft. A machine shop, amply equipped, is located upon platform on port side of engine room. Double bottom and feed-water tanks are fitted under boilers.

The peak tanks are arranged for the carrying of fresh or salt water and the coal bunkers are abreast of the boiler room, with a cross bunker aft of the boiler room. The drinking water tanks contain 4,000 gallons of fresh water and the gravity tank 500 gallons. The refrigerator space has a capacity of 550 cu. ft.

The propelling machinery is placed amidship and consists of two single-ended Scotch boilers, arranged fore-and-aft, with fireroom between the two. They are 16 ft. in diameter and 11 ft. between heads, with a working pressure of 200 lb. The engines are of the vertical, inverted-cylinder, triple-expansion, surface-condensing type, of about 1,800 horsepower, with cylinders 19¾, 31½ and 54¼ in. diameter by 36-in. stroke. The contract price of each tug is $194,000.

NAVAL TUG SONOMA ON HER TRIAL
Photo by New York Ship Building Co.

Launch of the Nelson

The steamer Nelson, building by the Fore River Ship Building Co., of Quincy, Mass., for the Cuba Distilling Co., of Havana, Cuba, was launched on Monday, Aug. 12, the christening ceremony being performed by Miss Madeline E. Mayer, daughter of Mr. and Mrs. Levy Mayer, of New York.

The Nelson is an improved duplicate of the steamer Currier, built by the Fore River Ship Building Co. and owned by the Cuba Distilling Co., and will be engaged in the transportation of molasses in bulk between Cuba, Porto Rico and American ports, principally New York. She is also constructed in such a way as to enable her to enter the trans-Atlantic trade.

The principal dimensions are as follows:

Length between perpendiculars, ft.	370
Beam molded, ft.	52
Depth molded to upper deck, ft.	30
Draught loaded, ft.	23
Gross tonnage, about	4,700
Net tonnage, about	2,800

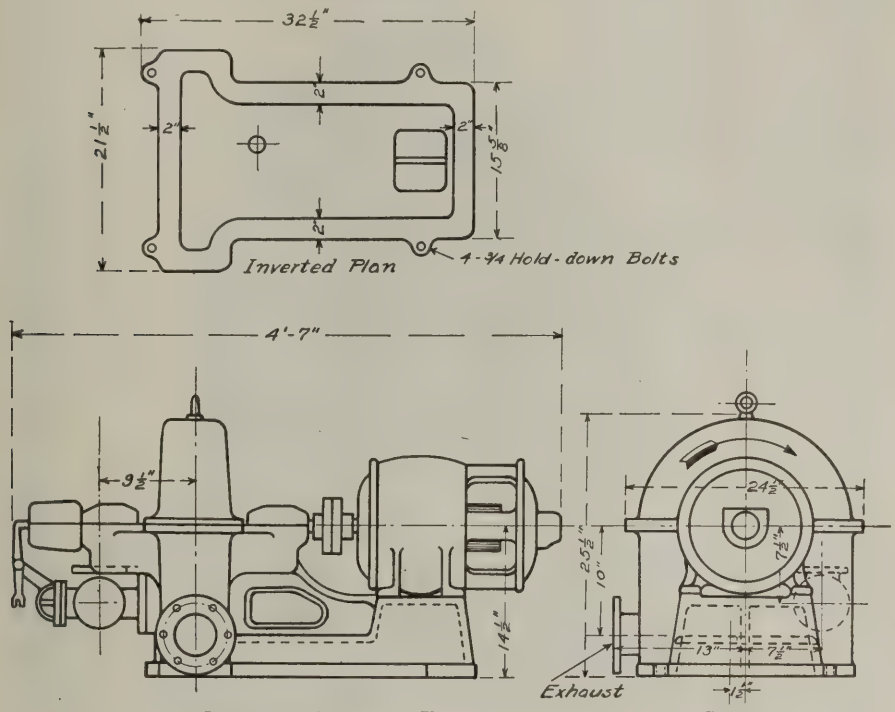
The vessel can be used for the transportation in bulk of molasses, oil, or other liquid cargo. The total stowing capacity for molasses is 190,000 cu. ft., representing over 1,400,000 gals. When carrying petroleum, with the oil carriage and tanks and inner bottom, the vessel will have a capacity of 1,600,000 gals.

The vessel has three pole masts fitted with cargo booms having a capacity of 5 tons each. The propeling machinery is located in the stern of the ship, consisting of a vertical inverted three-cylinder, triple-expansion engine with cylinders 25 in., 41 in. and 68 in. and a common stroke of 48 in., supplied with steam at 190 lbs. pressure by three single-ended Scotch boilers, working under the heated forced draft system. The engines will develop a maximum of 2,700 H. P., which will give the vessel a speed of more than 12 knots.

The Main St. Iron Works, 163-173 Main St., San Francisco, Cal., have under construction two passenger steamers for Charles R. McCormick & Co., and a freight steamer for the Southern Oregon Transportation Co.

Interesting Marine Electric Lighting Sets

Eight turbo generator sets each with a normal capacity of 10 kilowatts, have recently been supplied to the Erie Railroad Transit lines for use on their great lakes steamers by The Terry Steam Turbine Co., of Hartford. The necessity for light weight in marine work, together with ample rigidity, was the principal factor of consideration in the design of these outfits. The weight of the combined unit, including turbine and generator, is only 1,100 lb., or 110 lb. per kilowatt.



SECTIONAL PLAN OF TERRY TURBINE LIGHTING SET

In some cases for electric light work machines of the so-called four-bearing type have been used. However, the necessity for decreasing the overall length as much as possible and the maintenance of true alignment has led to the present development of the three-bearing type of unit. In this type the sub-base for the generator is integral with the turbine base proper, eliminating the possibilities of misalignment. The turbine and generator rotors are substantially on the same shaft, being connected by a solid coupling which enable either the turbine or the generator to be easily taken apart without dismantling the whole machine.

Six of the sets in question are designed to operate with a steam pressure of 125 lb. with a maximum of 150, while two of them are designed for steam pressure of 100 lb. The machines are all run non-condensing and the guaranteed output is maintained with a back pressure of 5 lb. gage.

The turbines themselves are of the well-known Terry single stage type, the best workmanship possible being put into the entire machine. All rotating parts are liberally designed to insure absence of whipping, and are very carefully balanced, both statically and running at full speed, to eliminate the possibility of vibration.

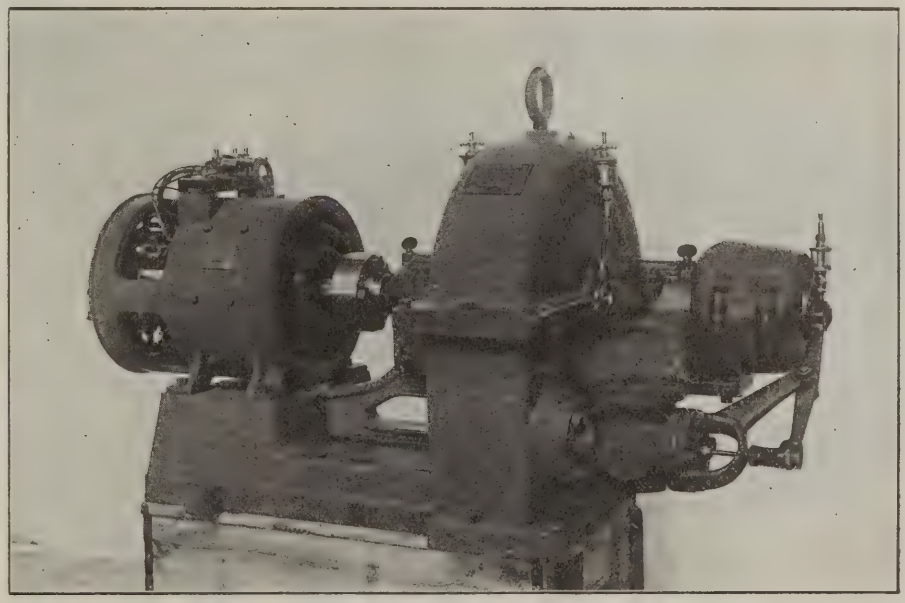
The generators are compound wound for 125 volts and are guaranteed to run at full load for 24 hours continuously with a rise in temperature not exceeding 40 degrees in the armature and 45 degrees in the commutator when run for two hours. The generator efficiency at full load and 25 per cent overload was guaranteed at 86 per cent.

A thorough test of all these sets was conducted at the makers' works before shipment, the tests on two of these machines being witnessed by the consulting engineers of the steamship line, on March 1 last. The summary of one of the tests witnessed follows:

Throttle pressure, pound, gage	149.4
High pressure inlet, pound gage	114.8
Back pressure of exhaust, gage	5
Quality of steam by calorimeter	.994
Revolutions per minute	3,200
Volts at terminal	120.3
Amperes at terminal	86.8
Load in kilowatts	10.4
Total pounds steam per hour	779
Total pounds dry steam per hour	775
Pounds steam per kilowatt hour	74.7
Pounds dry steam per kilowatt hour	74.25
Duration of test	1 hour
Momentary speed variation, full load thrown off, per cent	2.18
Settled speed variation, full load thrown off, per cent	0.96

The figures on all the machines were inside their guarantee by a liberal amount. The speed regulation on these machines is deserving of special mention. The mean settled speed variation on the whole eight machines was 1.3 per cent with a momentary speed variation on the worst machine of 5 per cent and an average momentary jump on all the machines of 2.66 per cent.

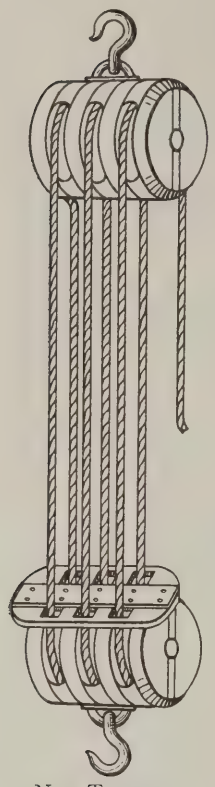
The general appearance and the small amount of room which they occupy is well shown by the accompanying illustration, the overall dimensions of which will be seen to be 4 ft. 7 in. length, extreme width 2 ft. 1½ in., and the extreme height 2 ft. 1½ in.



10 K. W. TERRY TURBINE-DRIVEN LIGHTING SET FOR ERIE RAILROAD TRANSIT LINE'S VESSELS

Star Non-Toppling Block

The Star non-toppling block and the Raymond releasing hook combined practically solve the principal difficulties of lifeboat launching and hoisting out. The merits of the Raymond releasing hook are well established and it is in use on practically 75 per cent of ocean and lake passenger vessels, as well as on a great many freight boats engaged in ocean and coastwise traffic. It is the only device for the purpose intended used in the United States navy and it forms part of the equipment of the vessels of the various departments of the United States government. The Star non-toppling and anti-fouling block device is new. It is easy to attach to blocks already in and is low in price. It was primarily designed to remedy the trouble and danger incidental to the lower blocks of lifeboat tackles capsizing and fouling after the load is released, but obviously it will be found advantageous when fitted to any double or treble purchase, such as topping lifts. The difficulties and the seriousness of blocks capsizing and fouling always experienced with lifeboat gear is well known. This simple anti-fouling device overcomes these troubles. Not only is it most desirable to have the tackles and blocks clear for rounding up for the purpose of getting another boat under way from the same davits when required but it is of great importance to have the blocks clear for quickly hooking onto a returning boat, especially in a seaway or in a tide-way when delay in this respect may prove more or less fatal. The device is made of galvanized iron and its design is such that the rope falls will not chafe. It is claimed for the device that it absolutely prevents fouling, keeps the blocks clear and in a vertical position in readiness for quickly hooking on and that they will remain so until the boat is hoisted inboard.



NON-TOPPLING BLOCK.

THE BARK HESPER

Bark Hesper in Commission

So urgent appears to be the demand for tonnage on the Pacific coast, especially in the lumber trade, that the old wooden American bark Hesper, now under the Peruvian flag, which has been lying idle on Puget Sound for the past four years, has been placed in commission. She will carry a cargo of lumber from Gray's Harbor to Valparaiso. Capt. Fred Hackett, who bought the Hesper two years ago, will sail her.

Trials of Torpedo Boat Destroyer Beale

The torpedo boat destroyer Beale, built by Cramp's, Philadelphia, recently underwent her trials with the following results:

Trial.	Average Speed.	Average R. P. M.	Av. shaft H. P.
4-hr. full speed.	29.649	783.28	11,800
4-hr. 25-knot....	25.000	617.14	6,250
4-hr. 16-knot....	16.346	380.785	1,345
Average five highest standardization runs	32.235	904.42	15,158.4

The Fumigating & Fire Extinguishing Co. of America, 29 Broadway, New York, has received an order from Dr. Guiteras, Cuban government health officer, for two sets of their apparatus, for shipment to Havana.

Personals

Admiral F. T. Bowles, president of the Fore River Ship Building Co., has been seriously ill, but is convalescing.

F. J. McDonald, president of the Philadelphia Ship Repair Co., has returned from a trip to Europe greatly benefited in health.

E. C. Felton, president of the Pennsylvania Steel Co., does not think that the extension of American register to foreign-built ships engaged in foreign trade would have any practical results, owing to the increased cost of operation which such register entails.

Prof. Herbert C. Sadler, of Ann Arbor University, has been requested to teach a post graduate course in marine engineering at the Naval Academy at Annapolis for a few months. He will undertake the work immediately.

The Royal Mail Steam Packet Co. has ordered four new 650-ft. passenger steamers for Panama canal traffic.

"Thermit Welding" and Its Application In *Your* Class of Repair Work

The application of "Thermit Welding" to many repairs, such as welding broken rudder frames, stern-posts, rudder posts and other heavy sections of wrought iron and steel has made it possible to weld these broken parts quickly and economically.

It is seldom necessary to dismantle the vessel and it can be taken from drydock in three or four days, ready for service.

"Thermit Welding" saves hundreds of dollars in repairs of this kind and has been adopted by many large repair works.

Our process of welding has received the sanction of the British Corporation for the Survey and Registry of Shipping, Glasgow.

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These boilers hold the record for economy, capacity and endurance in the Navies of the World.

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Babcock & Wilcox Boilers have all essential parts heavier than corresponding parts in Scotch boilers, giving greater security against corrosion. They are lighter, safer, easier to clean and to operate than Scotch boilers, and much more efficient.

We are constantly receiving "repeat orders" from owners of merchant vessels who have had many years' satisfaction from the earlier installations.

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On a Bale of Oakum
INSURES QUALITY
Grades—Best, U S. Navy, and Navy, both Spun and Unspun.

Also Plumbers' Oakum and Spun Cotton.

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We were established in 1840, and for over 70 years have been doing a business that has been made possible only by "Square Dealing".

"Quality, First, Last, Always"
IS OUR MOTTO

Let us hear from you at once.

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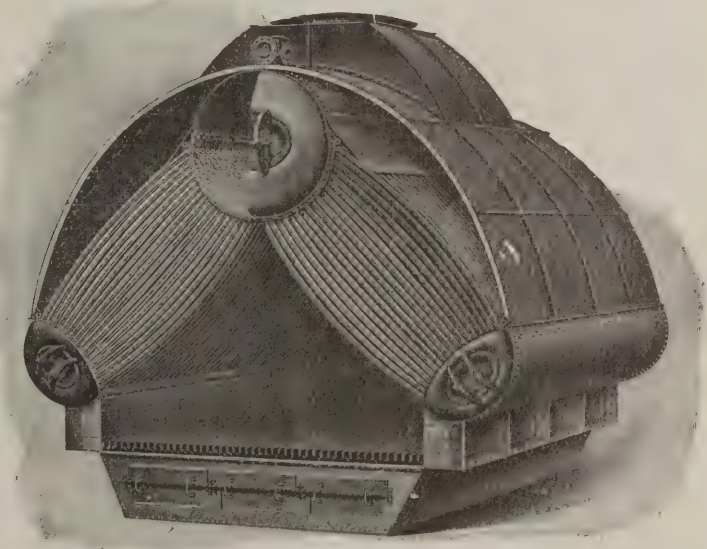
JERSEY CITY N.J.

Mosher Water Tube Boilers



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Any tube can be replaced without disturbing any others. Fifty tubes removed through one hand-hole. Curvature of tubes just sufficient to avoid expansion troubles. Greatest facility for cleaning interior and exterior of tubes. No screwed joints, all tubes expanded. All parts of wrought steel. Send for catalogue.

MOSHER WATER TUBE BOILER CO.
30 Church Street, NEW YORK

Scherzer Rolling Lift Bridge for England

One of the principal bridge building contracts of the year has just been placed by the Great Central Railway of England, with Sir William Arrol & Co., Ltd., of Glasgow, Scotland, for the construction of a large new railway and highway Scherzer rolling lift bridge and approaches across the River Trent, at Keadby, in Lincoln, England. The requirements of navigation at this point on the River Trent, just above where it enters into the River Humber, are quite severe and necessitated the most careful consideration in selection of the type of draw span, and the engineers of the railway company visited all of the important modern movable bridges in Great Britain and America before deciding upon the Scherzer type as best fulfilling the requirements of navigation and the very heavy traffic over the bridge.

The structure will be composed of two fixed approach spans in addition to the bascule span and the track girder span upon which the moving leaf rolls in its operation, on the well-known simple Scherzer principle. The total length of steel work will be nearly 500 feet. Each span will have three trusses, the center truss dividing the railway and roadway portions of the bridge deck. The railway section will have a width of 29 ft. and the roadway 24 ft. center to center of trusses.

The movable span of this bridge is of the Scherzer single leaf through type and as it will have a movable length of 160 ft. and an extreme width of nearly 60 ft. it will be one of the largest bascule bridges in the world. The machinery and power equipment designed for opening and closing the bridge in one minute is very simple and effective for so large and heavy a structure. The power will be electricity generated in a machinery house alongside the bridge and this current will actuate the motors which are placed on the rear end of the movable leaf. These motors are geared to the main operating shafts which drive pinions engaging with racks on independent fixed supports outside of the plane of the movable bridge trusses. This method of operation is one of the special features of the latest designs of Scherzer rolling lift bridges, and reduces the machinery and power required to a minimum even in the largest and heaviest structures.

The sub-structure will consist of steel caissons carried to about 50 ft. below the low water of ordinary spring tides and the masonry piers carrying the superstructure will be founded upon these caissons.

The entire bridge is designed in accordance with the latest practice in both foundations and steel structures to carry the heavies main line traffic of the Great Central railway between Doncaster, Grimsby and the large modern Immingham Docks on the Humber river.

Sir. William Arrol & Co., Ltd., will execute the work under the supervision of J. B. Ball, engineer in chief of the Great Central Railway Co., London, by whom the foundations and approach spans were designed. The Scherzer Rolling Lift Bridge Co., Chicago, Albert H. Scherzer, president and chief engineer, designed the superstructure, operating machinery and power equipment of the bascule span, and will maintain a general consulting engineering supervision over the manufacture and erection of that portion of the work in co-operation with Mr. Ball's staff.

Relation of Horse Power to Kilowatt

There was, before 1911, no precise definition of the horsepower that was generally accepted and authoritative, and different equivalents of this unit in watts are given by various books. The most frequently used equivalent in watts, both in the United States and England, has been the round number, 746 wats; and in 1911 the American Institute of Electrical Engineers adopted this as the exact value of the horsepower. It is obviously desirable that a unit of power should not vary from place to place, and the horsepower thus defined as a fixed number of watts does indeed represent the same rate of work at all places. Inasmuch as the "pound" weight, as a unit of force, varies in value as the acceleration of gravity varies, the number of foot-pounds per second in a horsepower accordingly varies with the latitude and altitude. It is equal to 550 foot-pounds per second at 50° latitude and sea level, approximately the location of London, where the original experiments were made by James Watt to determine the magnitude of the horsepower.

The "continental horsepower," which is used on the continent of Europe, differs from the English and American horsepower by more than 1 per cent, its usual equivalent in watts being 736. This difference is historically due to the confusion existing in weights and measures about a hundred years ago. After the metric system had come into use in Europe, the various values of the horsepower in terms of local feet and pounds were reduced to metric units and were rounded off to 75 kilogram-meters per second, although the original English value was equivalent to 76.041 kilogram-meters per second. Since a unit of power should represent the same rate of work at all places, the "continental horsepower" is best defined as 736 watts, this is equivalent to 75 kilogram-meters per second at latitude 52° 30′, or Berlin. The circular gives tables showing the variation with latitude and altitude of the number of foot-pounds per second and of kilogram-meters per second in the two different horsepowers.

These values, 746 and 736 watts, were adopted as early as 1873 by a committee of the British Association for the Advancement of Science. The value, 0.746 kilowatt, will be used in future publications of the Bureau of Standards as the exact equivalent of the English and American horsepower. It is recognized, however, that modern engineering practice is constantly tending away from the horsepower and toward the kilowatt. The Bureau of Standards of the Department of Commerce and Labor and the Standards Committee of the American Institute of Electrical Engineers recommend the kilowatt for use generally instead of the horsepower as the unit of power.

Sperry Gyroscopic Compass

The Sperry Gyroscope Co., 74 Broadway, New York, recently issued a catalog descriptive of the latest developments of the gyroscopic compass. These compasses are now being installed upon all of the large battleships of the United States navy and on submarine classes E., F., G., and H. In addition to having a very high directive power and being an instrument of great precision, the gyroscopic compass is the first in the world to point true north undeviatingly and continuously under all conditions of service. It is well known that the magnetic compass is variable, never pointing true north, and being especially inconstant upon steel ships. It is stated upon competent authority that the Sperry gyroscopic compass is the first that has been produced which stands on the meridian without correction or calculation under service conditions, no other gyroscopic compass existing which does not have a serious deflection factor.

Marine Paints for all Purposes

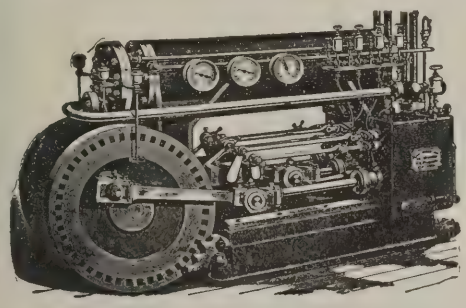
BPS BULK HEAD PAINT
BPS HOLD PAINT
BPS FUNNEL PAINT
BPS DECK PAINT
BPS DECK HOUSE PAINT
BPS HULL PAINT

B P S Aluminum and Gold Enamel. B P S Cabin and Engine Room Enamels.

THE PATTERSON SARGENT CO.
CHICAGO—NEW YORK—CLEVELAND

The Allen Dense-Air Ice Machine

contains no chemicals. It is placed in the engine room, while the ice-making box and meat rooms are at distant places of the steamer.



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Designer and Manufacturer Screw Propellers
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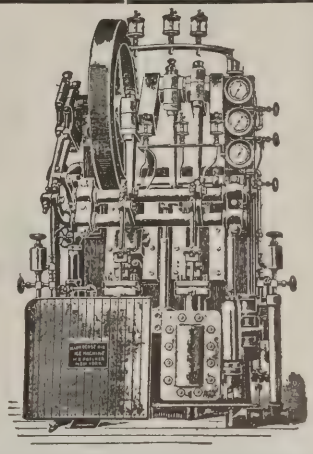

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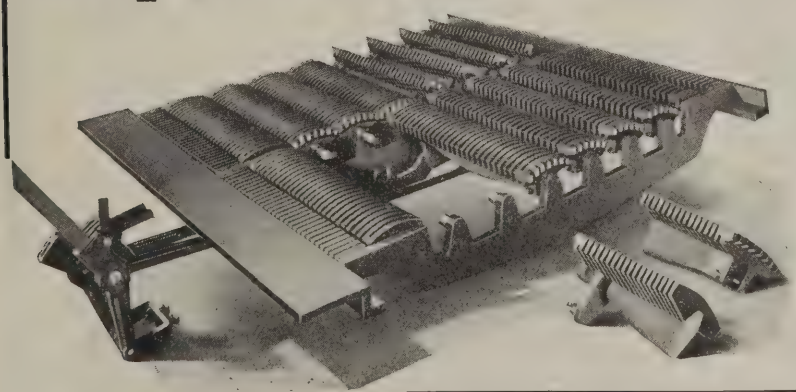

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Fuel Scow with elevators and discharging spouts. Storage of 800 tons. Discharges 250 tons an hour into steamers while unloading cargo.

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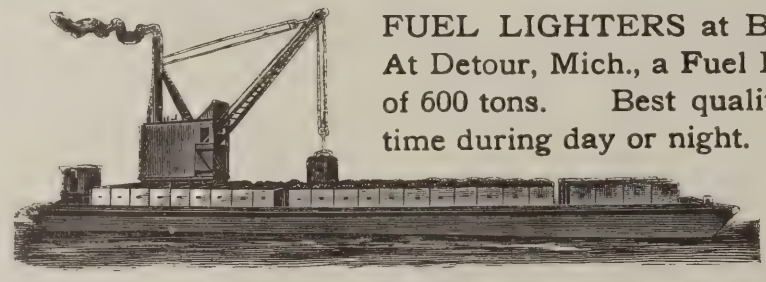
PICKANDS, MATHER & CO.



FUEL LIGHTERS at Buffalo, Erie, Ashtabula, Cleveland. At Detour, Mich., a Fuel Dock equipped with shute capacity of 600 tons. Best quality Pittsburg coal furnished at any time during day or night.

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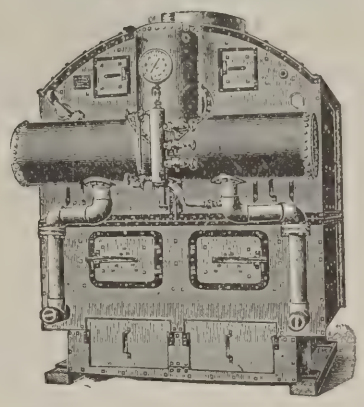

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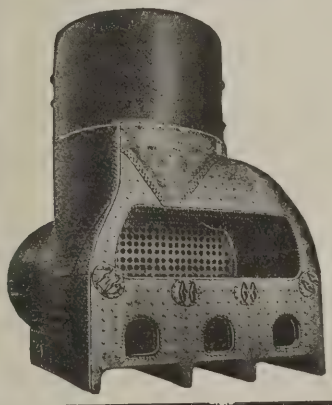

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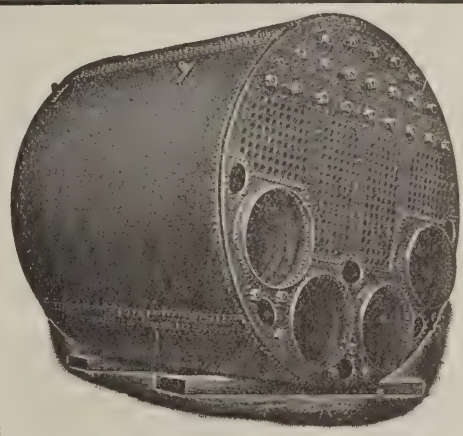

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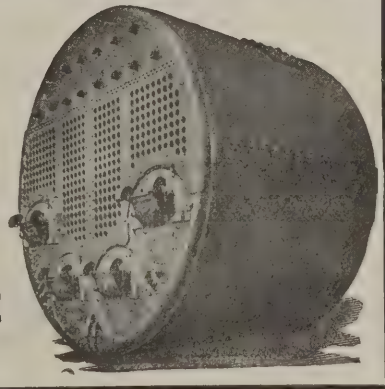

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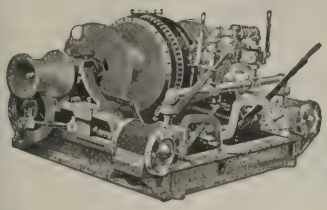

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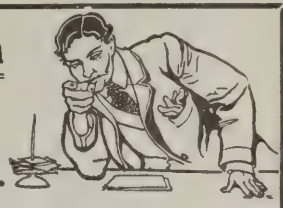

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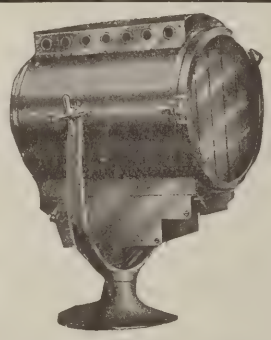

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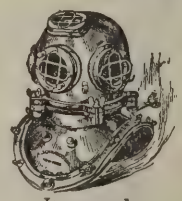

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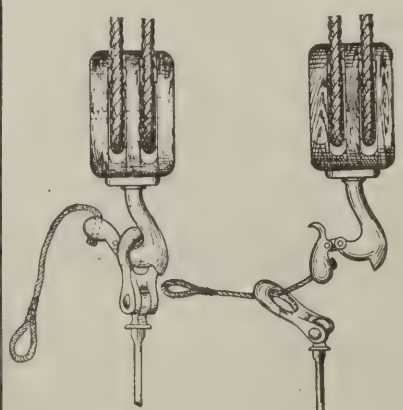

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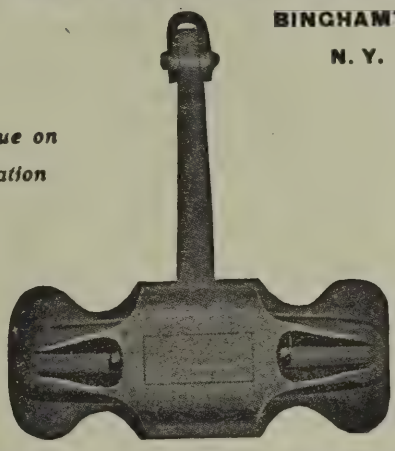

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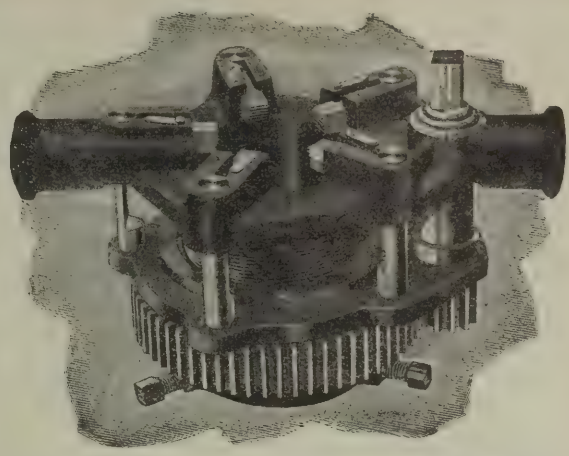

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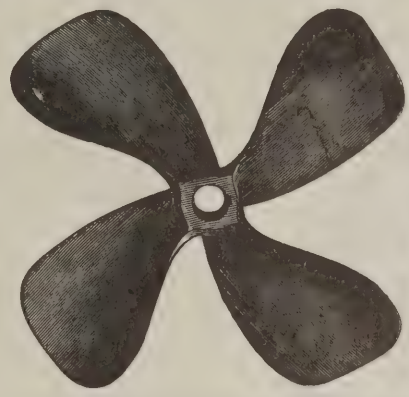

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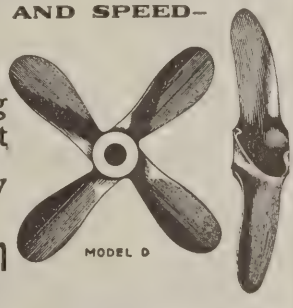

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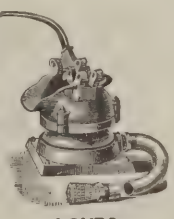

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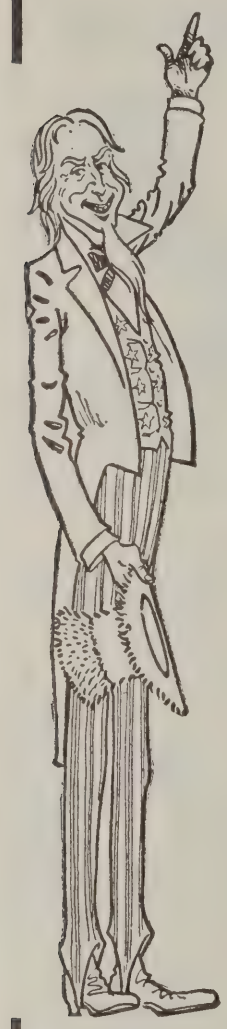

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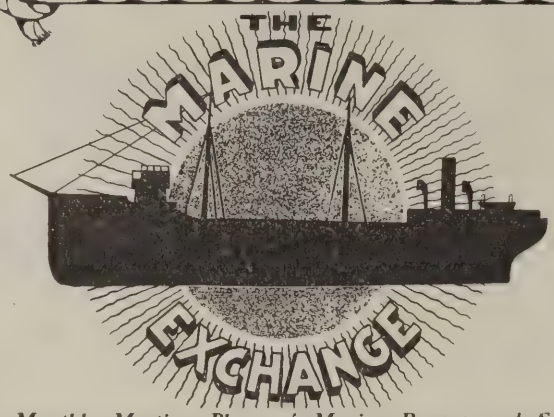

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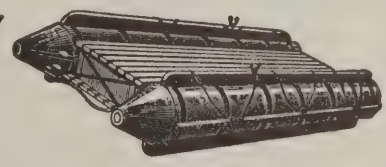

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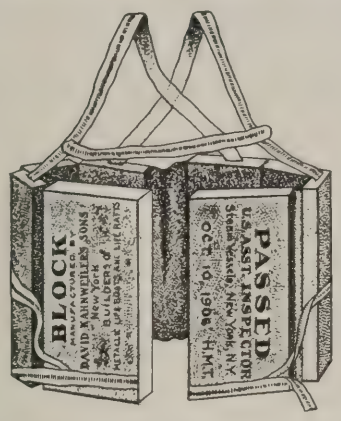

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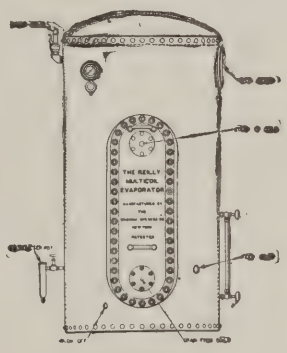

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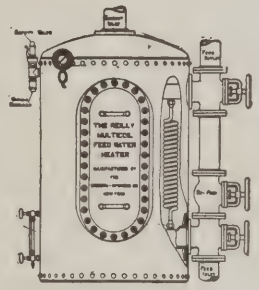

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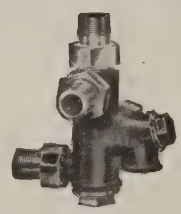

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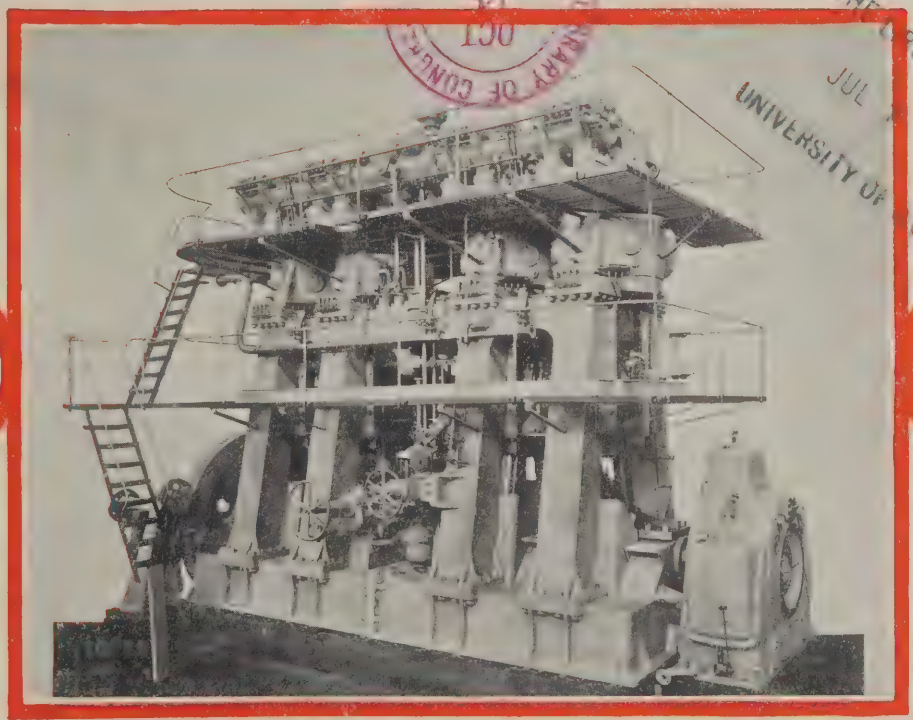

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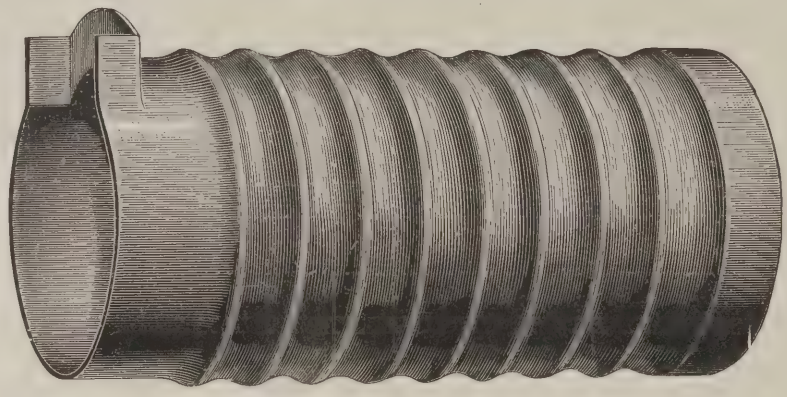

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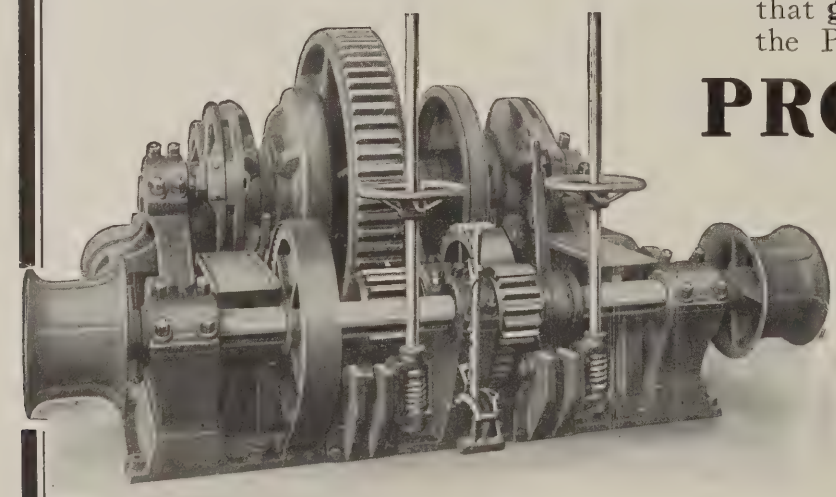

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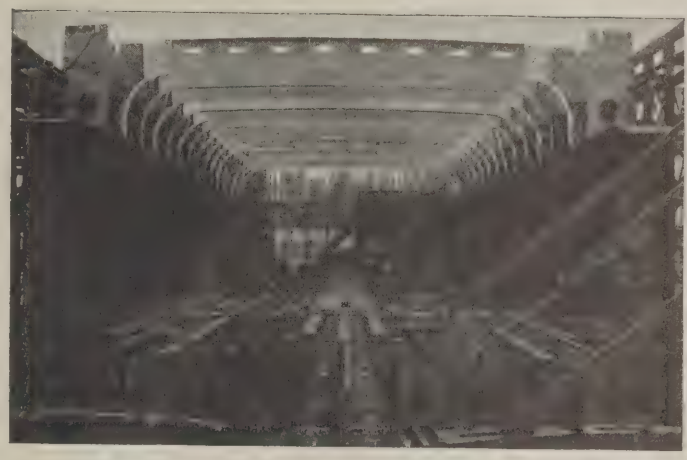

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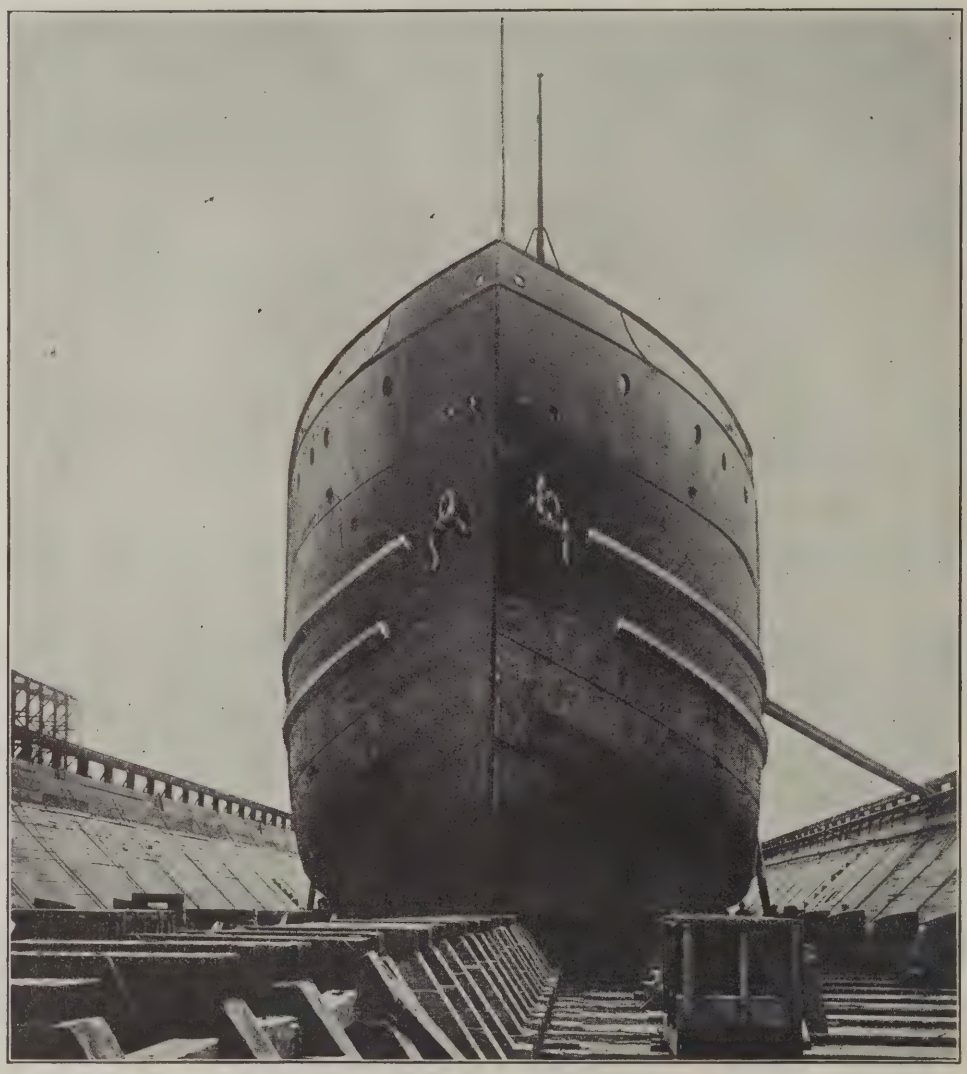

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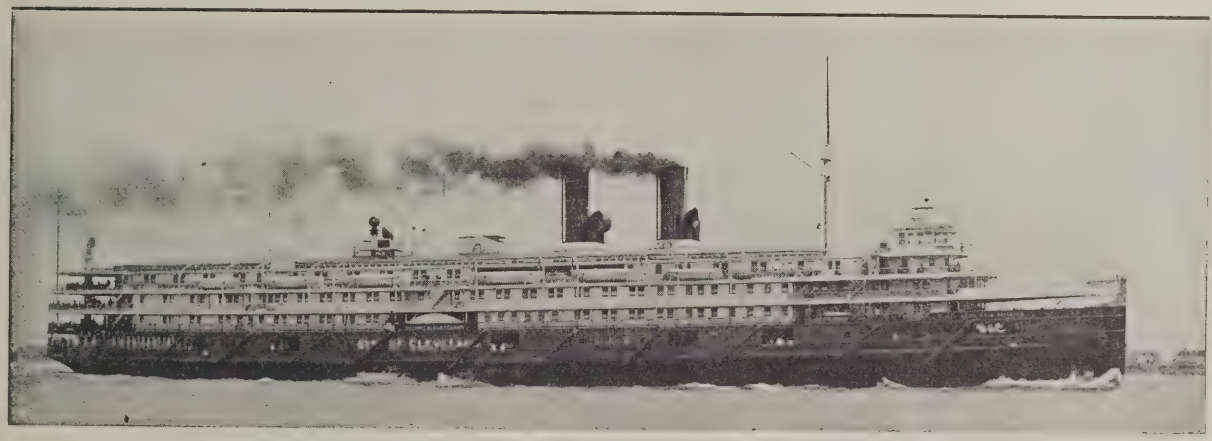

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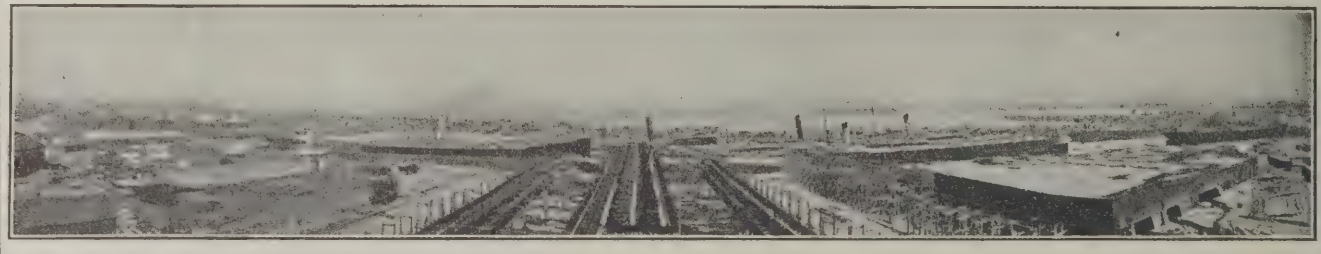

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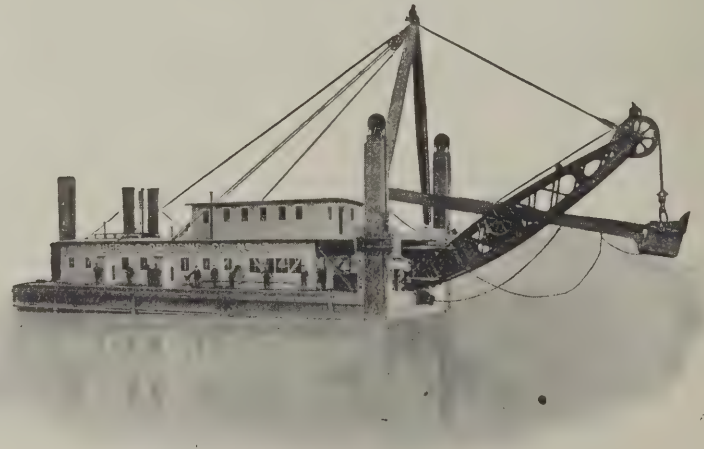

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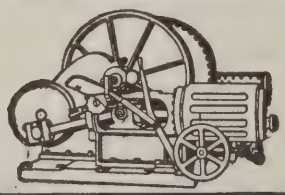

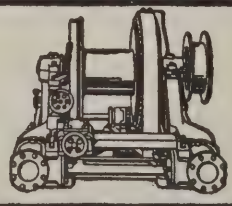

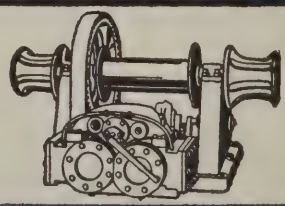

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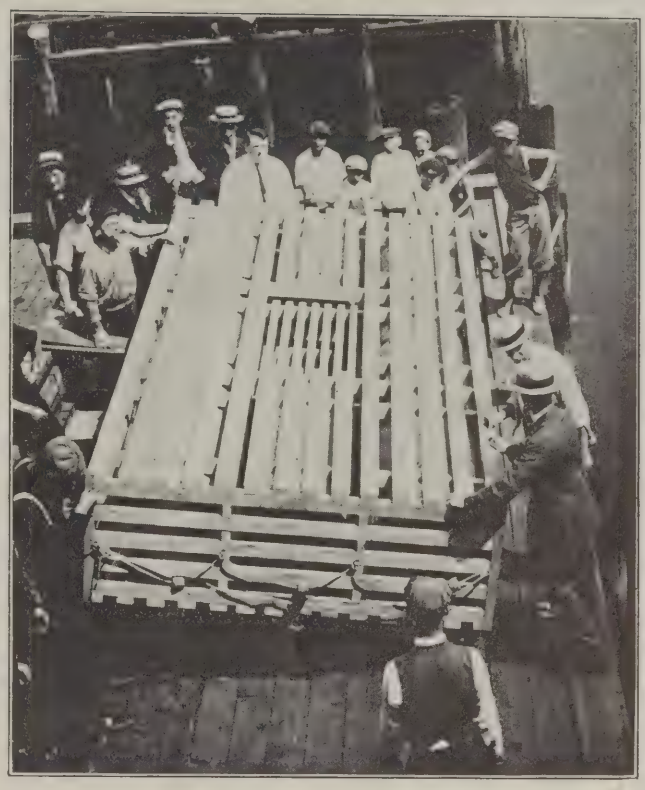

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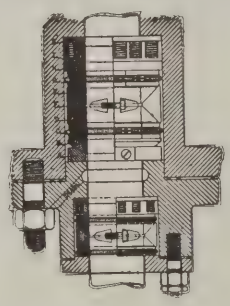

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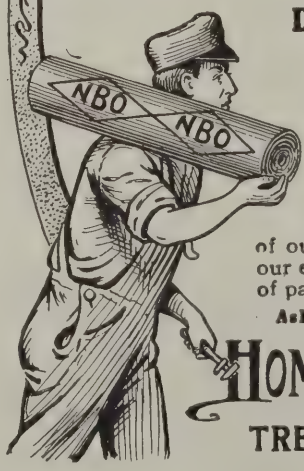

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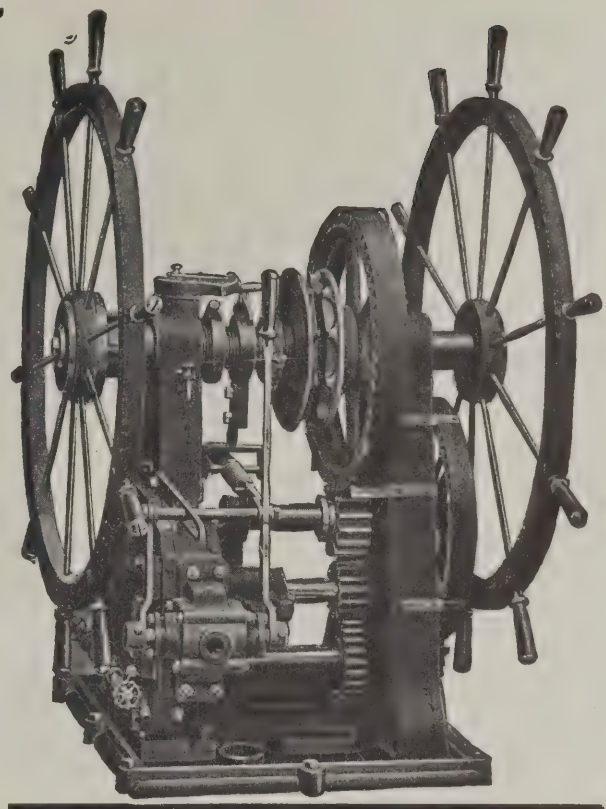

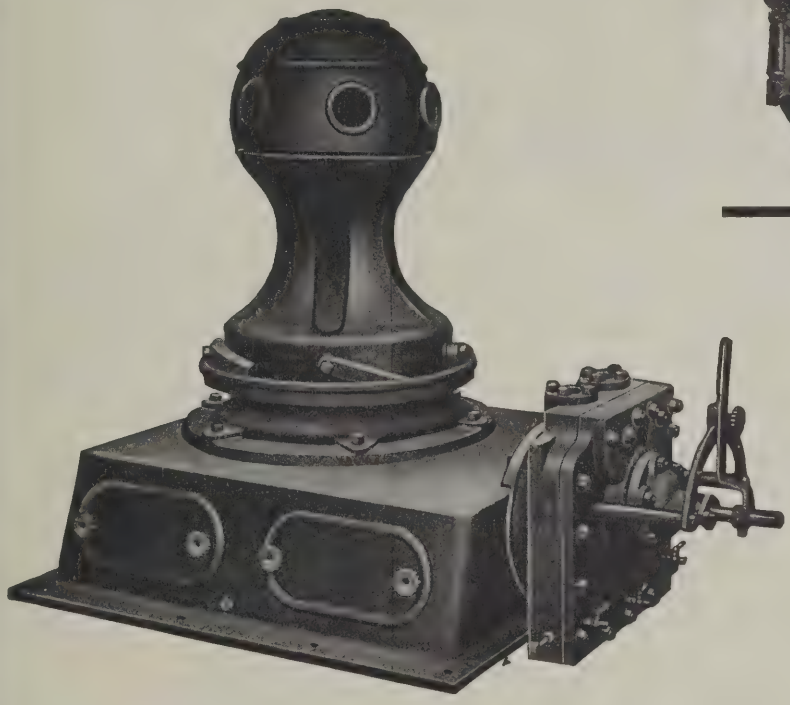

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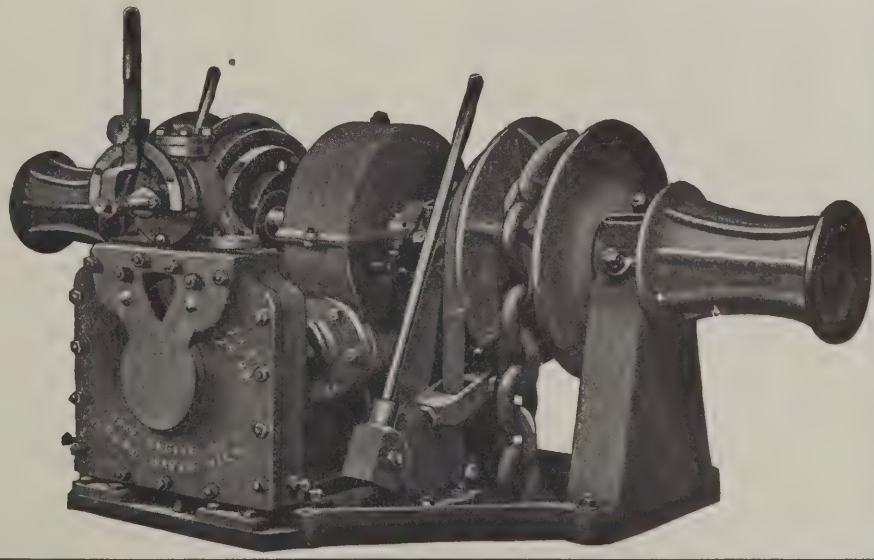

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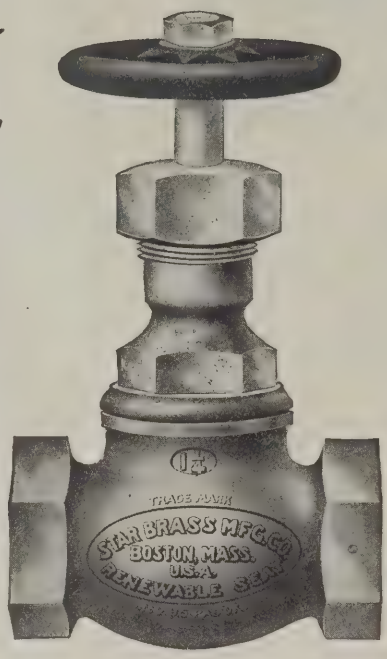

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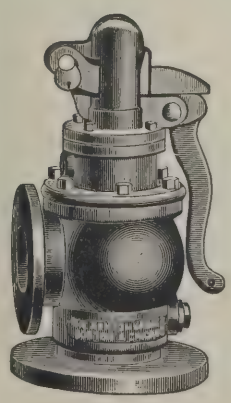

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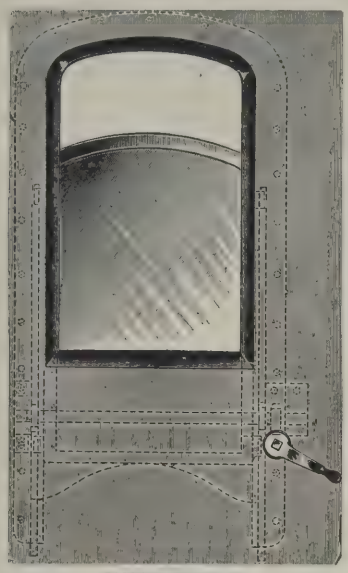

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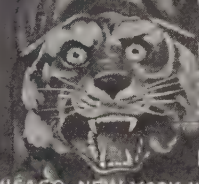

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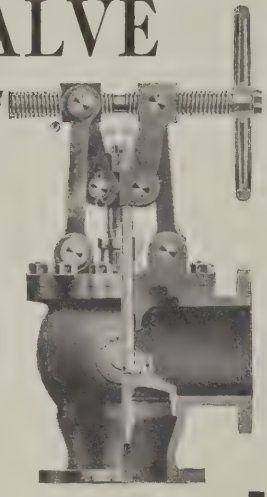

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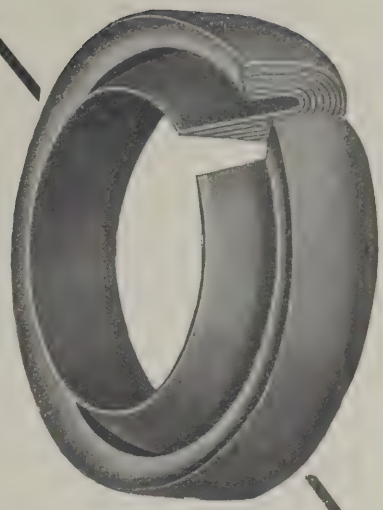

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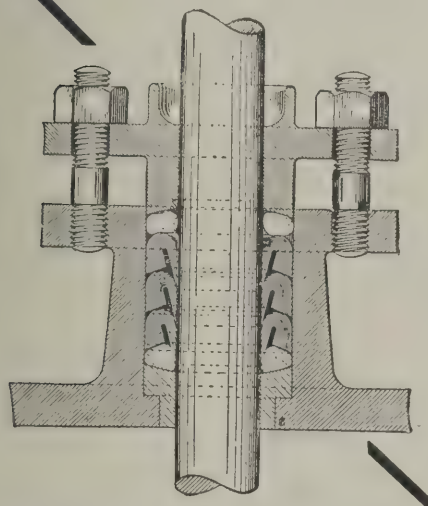

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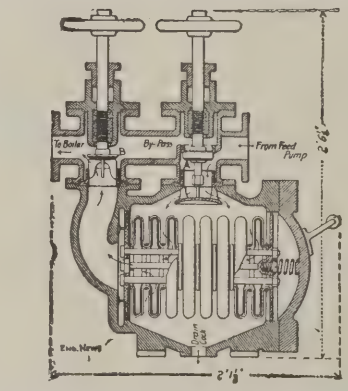

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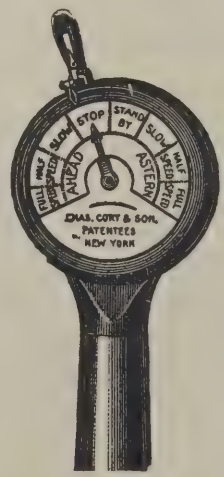

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3328

GREAT LAKES ENGINEERING WORKS

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Designers, Builders and Repairers of

Steel Freight and Passenger Ships
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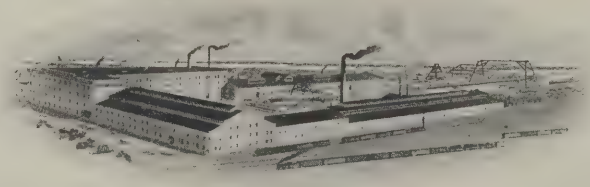
ECORSE PLANT—Ship Building—Dry Docks—Repairs

ASHTABULA PLANT—Ship and Engine Building—Dry Docks—Repairs



DETROIT PLANT—Engine Building and Repairs

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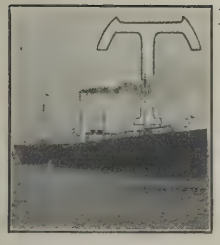
VOL. 42 CLEVELAND OCTOBER, 1912 NEW YORK No. 10

American-Hawaiian Steamers

A Fine Fleet is Being Created in Anticipation of Increased Business Through the Panama Canal



THE American-Hawaiian Steamship Co. is having built at the yard of the Maryland Steel Co., Sparrows Pt., Md., eight steamers in anticipation of additional business after the opening of the Panama canal. Rapid progress is being made in the construction and all the vessels will be in commission before the canal is opened to navigation next September.

The route on which these vessels are to be placed is from New York to San Francisco and Hawaiian Islands by way of the canal. Special attention has been paid to the arrangement of hatches for shipping large timbers. After the canal has been opened to the marine traffic of the world, the owners will insulate the upper 'tween decks for the purpose of carrying tropical fruits, the builders having created a suitable steel house on the shelter deck ready for the installation of the refrigerating machinery.

The owners specified one radical departure from their previous boats. They desired to take advantage of the decrease in weight that the longitudinal system of framing allows and thereby increase the earning power of the ships. All eight vessels are to be built on the Isherwood system, the company also recognizing the advantages gained by clearer holds, besides increased deadweight.

The Minnesotan, the first of the order to be launched, made her initial trip down the ways on June 8, followed by the Dakotan, on Aug. 10. The Minnesotan was delivered to her owners on Sept. 10. The principal dimensions of these boats are: Length between perpendiculars 414 ft. beam molded 53 ft. 6 in., depth molded to shelter deck 39 ft. 6 in., depth molded to upper deck 31 ft. 6 in. The vessels are built to the highest requirements of Lloyds under special survey, and are classed 100 A-1. The ships will carry 9,450 tons of deadweight on a draught of 28 ft. and maintain a service speed of 12 knots per hour.

Burn Either Coal or Oil

All have straight stems, elliptical sterns, three continuous steel decks with an additional steel orlop deck in No. 1 hold. The propelling machinery is located amidships, just forward of which is a deep tank with an oil-tight center line bulkhead for carrying either coal, cargo or fuel oil. At each end of ship is located a peak tank for carrying fuel oil or water ballast. The double bottom extends the entire length of boat with an oil-tight center keelson and is divided longitudinally into eight tanks, the three under the machinery space being intended for carrying feed water. Oil wells are built in to separate these tanks from the remainder, which are to be used for fuel oil or water ballast.

When it is decided to use coal instead of fuel oil in the boilers, the coal will be carried in a bunker on the second deck abreast the machinery space and in the deep tank. The combined bunkers have a capacity of 900 tons. A steel shaft alley is built in the two after holds, extending from machinery space to the after peak bulkhead. The ship's stores are carried at each end of second deck over peak tanks.

The vessels are fore and aft schooner rigged, with two steel masts and four king posts. The masts have eight booms each, one on the foremast being of 30-ton and one on the mainmast of 20-ton capacity. All other booms are capable of handling 5 tons. Each forward king post is fitted with two booms and the after ones with one each; the king post booms are of 3-ton capacity. All cargo booms are of seamless steel tubing imported from the Mannesmann Tube Works, Dusseldorf. To facilitate the handling of freight, four cargo ports are fitted to the lower 'tween decks and six to the upper 'tween decks. On each deck are six large hatches with wooden covers and in addition numerous small trimming hatches are distributed throughout on upper and second decks.

The deck machinery is composed of

a Hyde vertical wildcat pattern steam windlass with engine on deck below. Warping heads are fitted above wildcats. Four double geared and 10 single geared winches with single drums and gypsy heads are installed for handling freight; the winches have 9 in. by 14 in. double cylinders. Two heavy steam deck capstans with 9 in. by 9 in. cylinders fitted on deck, one forward and one aft. The steering engine is a Hyde geared quadrant type operated by means of a Brown telemeter from the pilot house, flying bridge and steering engine room. The engines are twin vertical engines, each capable of handling the rudder under any condition. The deck equipment consists of two 26 ft. metallic life boats, one wooden 20 ft. cutter and one wooden 22 ft. gig. All boat davits are Norton's patented screw gear type.

The accommodations for the passengers, officers and crew are large and airy, the aim being to make the quarters as comfortable as possible, as a considerable portion of each trip is in the tropics. The quartermasters, carpenter and boatswain are quartered in the forward end of upper 'tween decks. Their stores, lamp room, wash and toilet room are forward. At the after end of the upper 'tween deck the watertenders, oilers, seamen, firemen, wash and toilet rooms are installed.

The midship house contains dining saloon and pantry, officers' mess room and pantry, two spare staterooms, store rooms, freight clerk, cooks, steward, mess boys, chief, first, second, third, deck and refrigerating engineers, and bath and wash rooms. In a steel house at after end of shelter deck the hospital with bath and spare staterooms are fitted.

On the boat deck is located four staterooms and bath, wireless room, pilot house, chart room, first, second and third officers, officers' bath and the captain's stateroom, office and bath room. At each end of lower 'tween decks special freight rooms are bulkheaded off for bonded freight.

Propelling Machinery

The power plants for these ships are similar in design to that installed in the steamers Kentucky, Georgian and Honolulan, and consist of one four-cylinder, quadruple-expansion engine, three single end Scotch type boilers and the necessary auxiliaries.

The main engine cylinders are 25½, 37, 53½ in. and 76 in. in diameter by 54 in. stroke, having piston valves throughout and are supported by heavy box columns fitted with double slipper guides. The main air pump, two bilge pumps and an oil pump for forced lubrication to thrust block, are attached to L. P. engine. The crank shaft is 15¼ in. in diameter, and is in four interchangeable pieces, the cranks being set at equal angles.

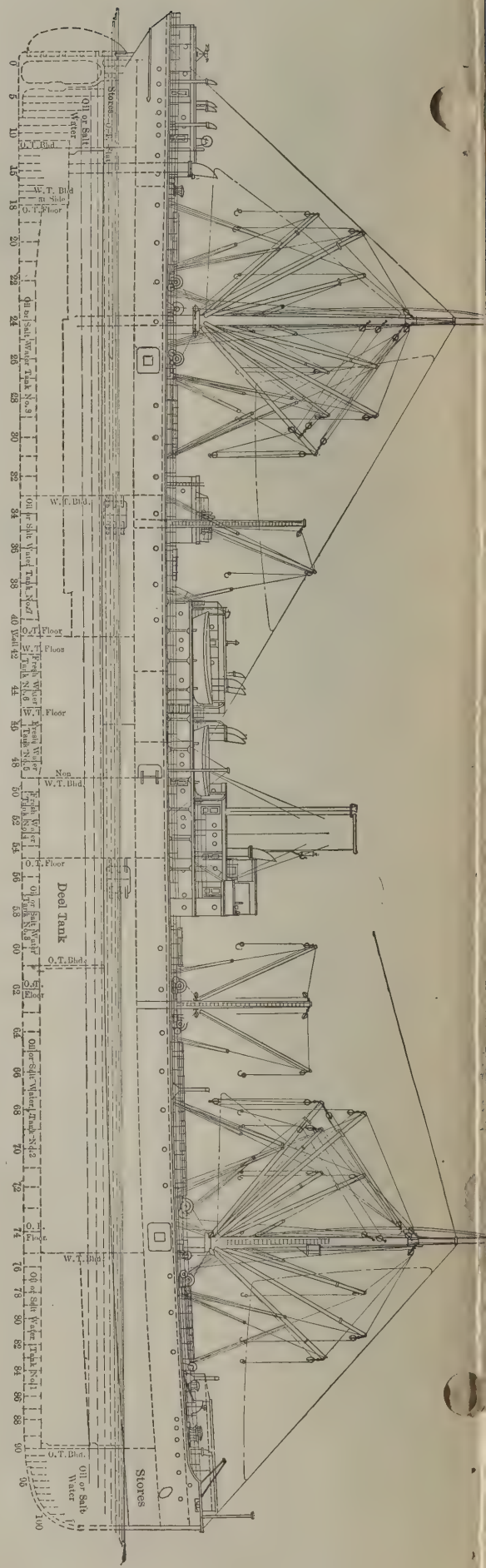
The propeller, which is 18 ft. 6 in. diameter by 18 ft. 6 in. mean pitch, has a cast steel hub with manganese bronze blades. The main boilers are 16 ft. mean diameter by 12 ft. 3 in. long, designed to meet the requirements of Lloyd's inspection rules for 215 lbs. working pressure. Each boiler contains four 41-in. inside diameter corrugated furnaces. The tubes are 2¾ in. diameter and the total heating surface is 3,173 sq. ft. per boiler.

The boilers extend through the engie room bulkhead and have all connections on the back heads in engine room. They are fitted with the Howden's system of forced draft and are built to burn either oil or coal as fuel. It is the intention to burn oil for the greater part of the time, but all the necessary grate bars, etc., are carried so that the change to coal may be made at any time. When burning oil the steam atomization system is used with the necessary pumps, oil heaters and filters, etc., carried on the forward fire room bulkhead. The fuel oil system throughout is furnished in duplicate. The donkey boiler is 10 ft. diameter by 9 ft. 6 in. long, built for 215 lbs. per sq. in. working pressure and to burn either coal or oil fuel.

There are also provided two long stroke simplex feed pumps, a duplex fire and bilge pump, an oil trim pump, a duplex ballast pump, a fresh water pump, an auxiliary condenser with attached air and circulating pumps for port use, a 14-in. centrifugal circulating pump, two 20-ton evaporators with pump, two distillers with pump and aerating tank, a forced draft blower, a 2-ton refrigerating plant and a multicoil feed heater. A drill press, a lathe and an emery wheel are installed on the starboard side in engine room and operated by an electric motor.

A system of mechanical ventilation for the cargo holds has been installed with two motor-driven fans located in engine casing.

Glasgow's oversea trade is world-wide and her ships are to be found in all quarters of the globe. Last year 13 different nations were represented at one time or other at Glasgow, and the number of countries has been as high as 17, but not a single American-owned ship has reached the Clyde since 1906.



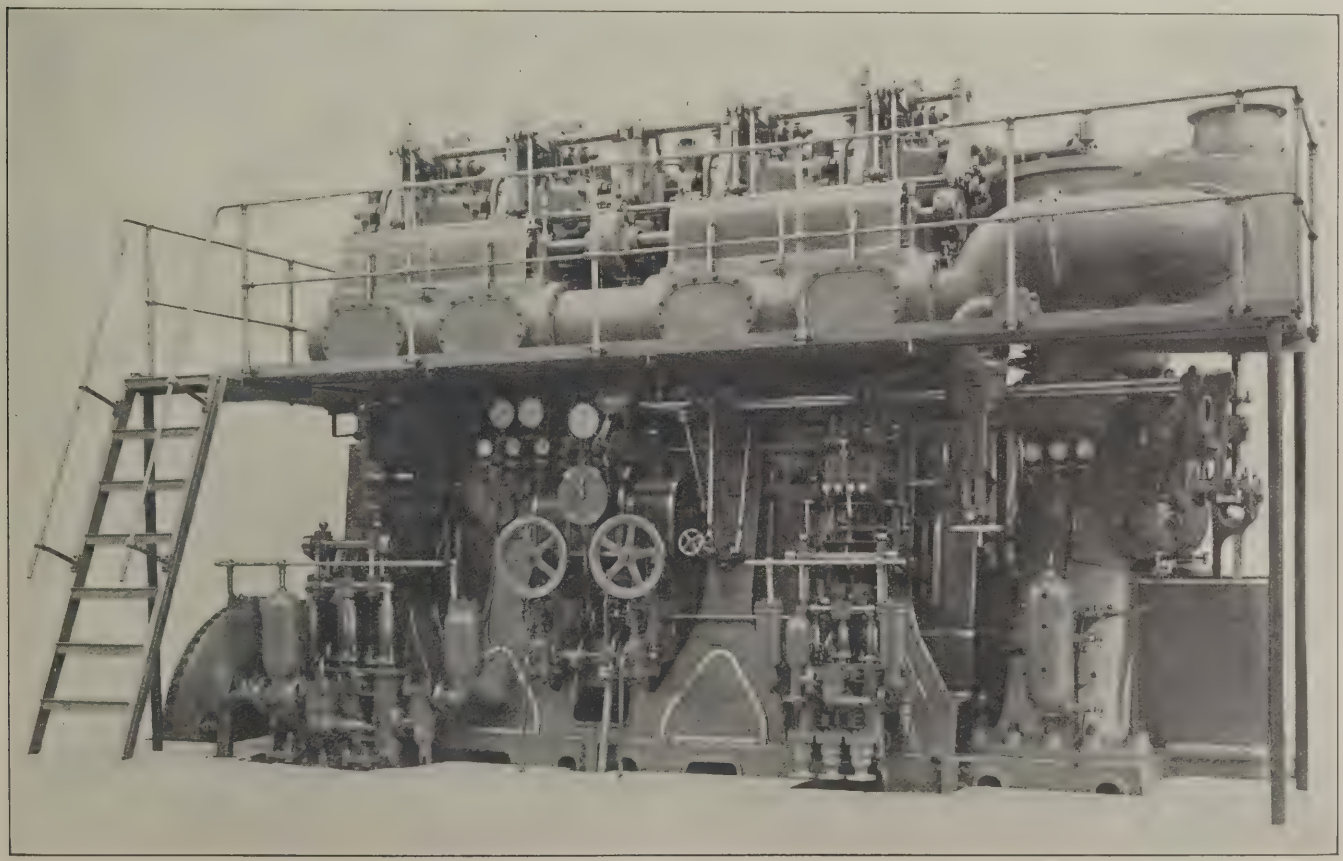
INBOARD PROFILE OF THE AMERICAN-HAWAIIAN STEAMSHIP CO.'S NEW STEAMER MINNESOTAN

MONTE PENEDO

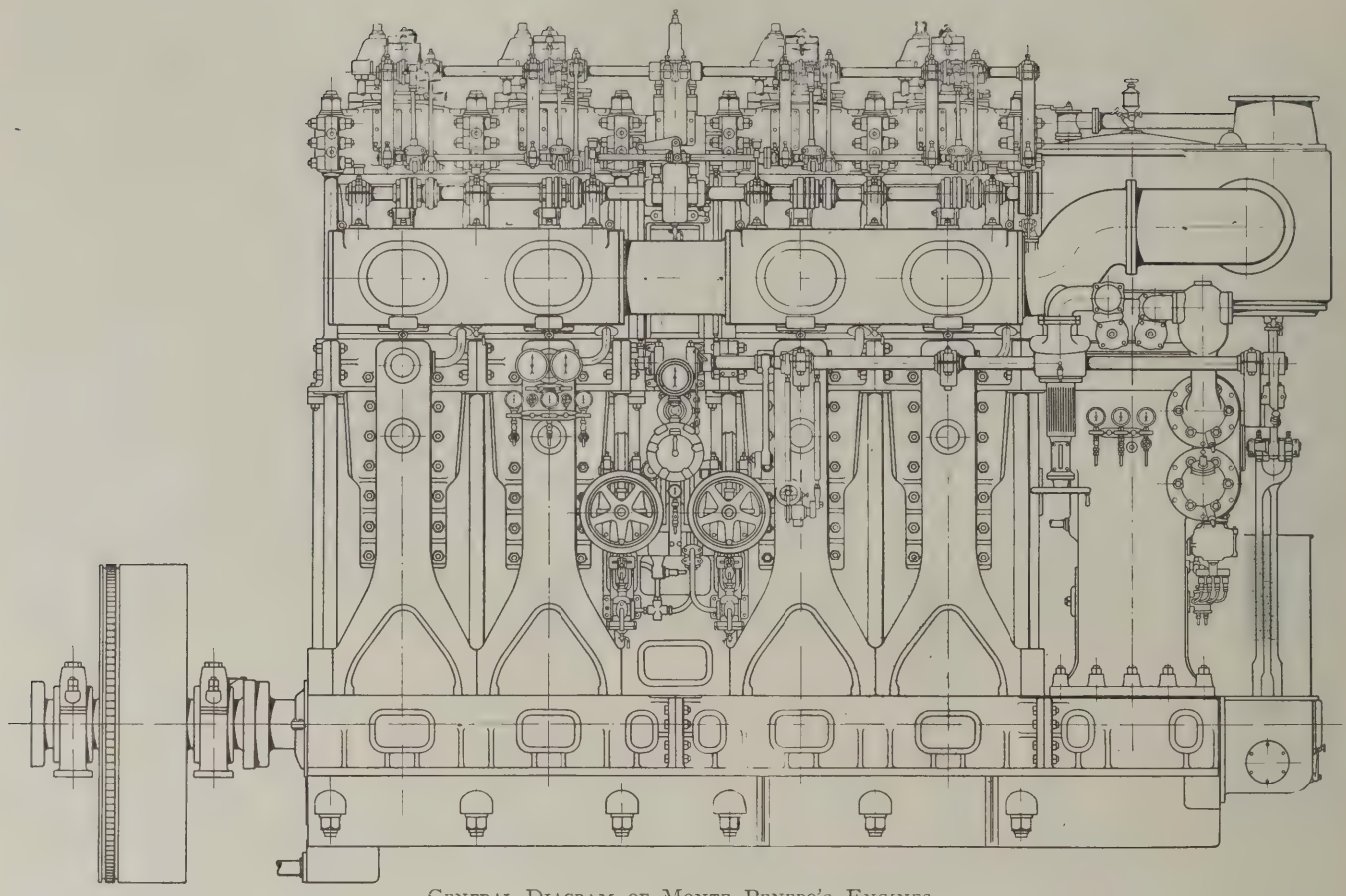
THE NEW HAMBURG-SOUTH AMERICA MOTOR-DRIVEN SHIP

IN THE shipping world considerable interest is being taken in the combat for supremacy between the four-cycle and two-cycle Diesel oil engines. To the four-cycle type fell all the early honors, and though the ultimate superiority of the two-cycle engine is scarcely to be denied, owners are anxious to learn whether this type is satisfactory in the present state of the art. The first motor ship to cross the Atlantic, the Toiler, which came to the Great Lakes, had two-stroke engines, but they were of small power and did not afford any useful information concerning the size of motors required for the regular ocean-going ships. The first really important two-cycle installation completed was that of the Eavastone, 3,200 tons dead weight, for the Furness Withy line, to which extended attention was given in the September issue of THE MARINE REVIEW. The present article has to do with the new Hamburg South American motor ship, Monte Penedo, having a two-cycle engine of the Sulzer-Deisel type.

Monte Penedo, which is 350 ft. long, 50 ft. broad, 27 ft. deep and measures 4,000 tons gross, can carry about 6,500 tons deadweight. Compared with a triple-expansion steam installation the motor machinery shows a reduction of 250 tons in weight. Computed upon a voyage from Hamburg



ONE OF THE 1,000 I. H. P. SULZER-DIESEL TWO-CYCLE, SINGLE-ACTING ENGINES OF THE MONTE PENEDO



GENERAL DIAGRAM OF MONTE PENEDO'S ENGINES

to Buenos Aires, 13,500 miles, the fuel consumption of the new motor ship will be 430 tons against the 1,750 tons of an equivalent steamer with a triple-expansion engine, giving a gain of 1,320 tons for cargo outward and 660 tons homeward or a mean of 990 tons on the round voyage. A steamship with a quadruple-expansion engine might have a coal consumption of only 1,500 tons on the round voyage, and allow a mean gain of 800 tons for cargo to the motor ship. These figures relate to 2,000 I. H. P. and a speed of 10½ knots, representing the engine power and speed respectively of the Monte Penedo, to which therefore a gain of 16 per cent in cargo-carrying capacity has to be credited in comparison with a vessel having a quadruple-expansion engine and just under 20 per cent gain compared with a ship having triple-expansion. The additional hold capacity afforded to the motor ship by her reduced engine room and bunkerage is reported to be 30,000 cu. ft. And over and above these advantages the owners will profit by an economy of $30,000 per annum on engine room wages, leaving out of account altogether the difference in fuel bills, which, as a result of oil-bunkering on the American side, should be considerably to the credit of the motor vessel.

Two-Cycle, Single-Acting Type

The main engines are of Sulzer's two-cycle single-acting type, developing each 1,000 I. H. P. at 160 revolutions per minute, and having cylinders 470 mm. diameter and 680 mm. stroke. The bed plate is cast in three sections, and upon it are the hollow cast iron columns, which make the engine rigid and take up the transverse stresses. Steel columns are bolted

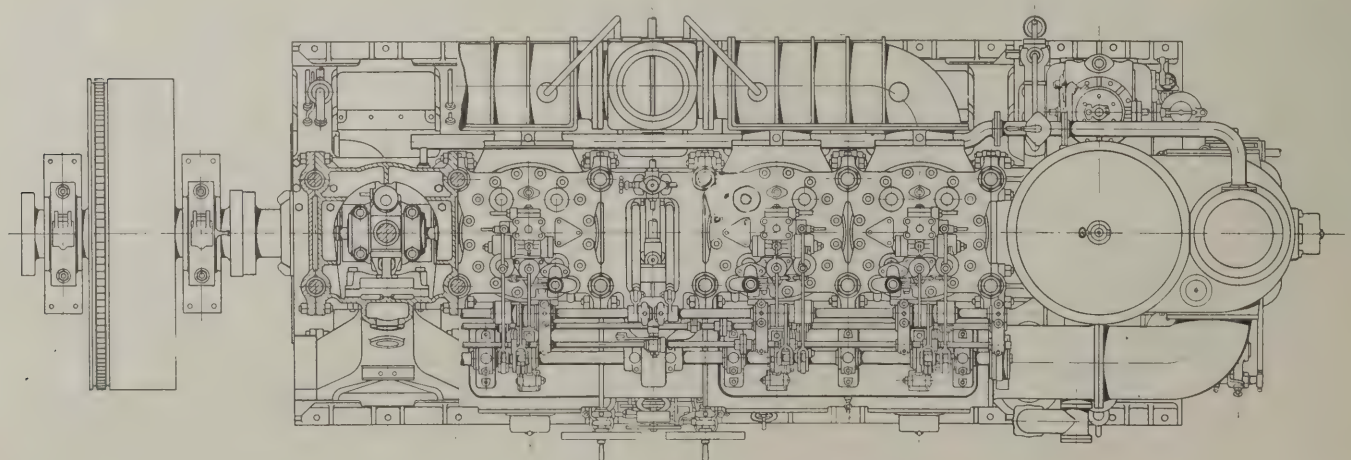
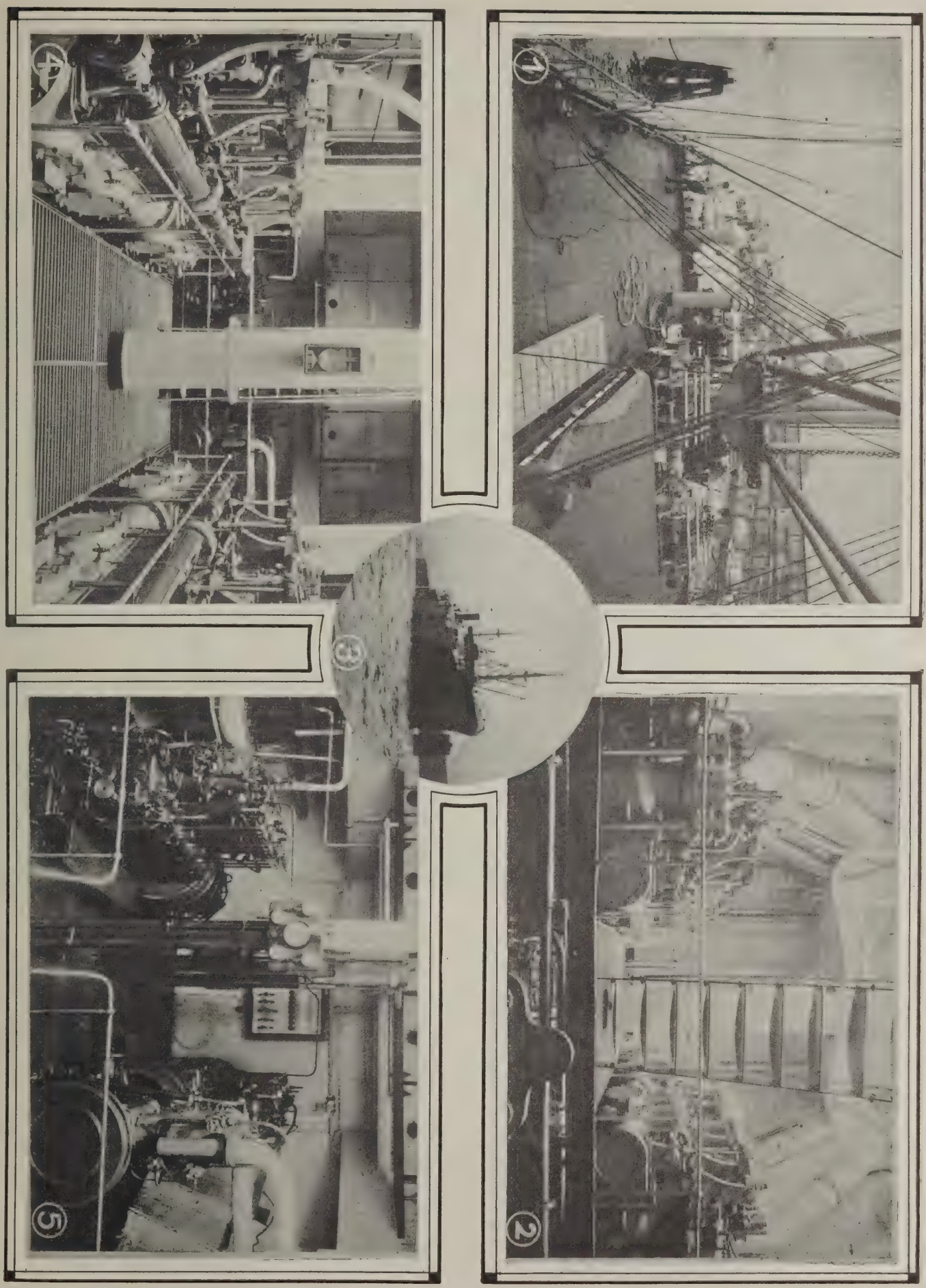
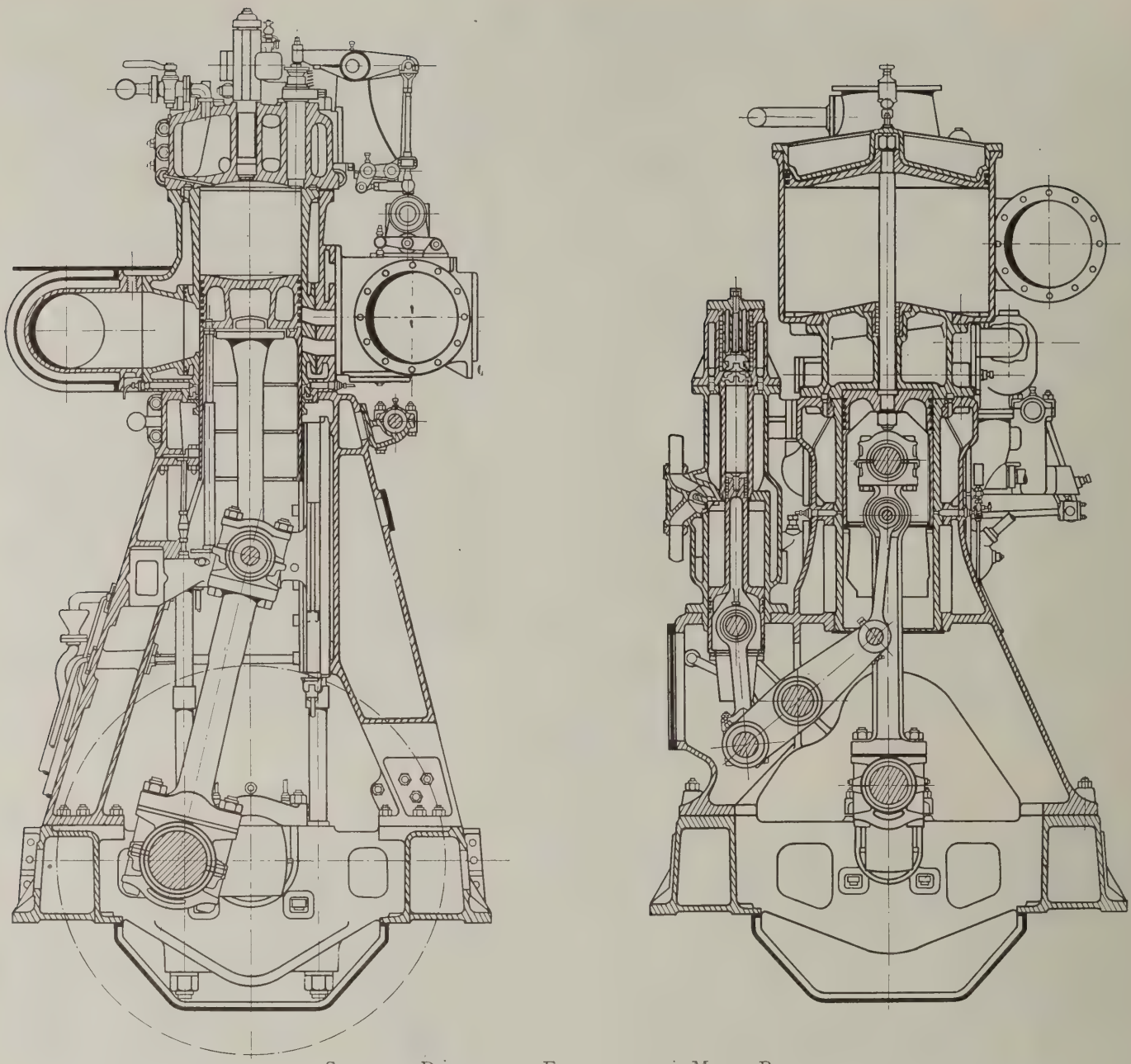


DIAGRAM OF MONTE PENEDO'S ENGINES



1—The Forward Winches and Derricks. 2—The Cam Shaft Platform Between the Twin Diesel Engines of the Monte Penedo, View From After End. 3—Bow View of the Monte Penedo. 4—The Cam Shaft Platform Between the Twin Diesel Engines of the Monte Penedo, View From Forward End. 5—Two Auxiliary Diesel Engines of the Monte Penedo



SECTIONAL DRAWINGS OF ENGINES OF THE MONTE PENEDO

right through from the cylinder heads to the bed plate, and therefore the stresses communicated to the crowns through the operations in the cylinders are not imposed upon the cylinder bodies proper. Single-type guide shoes, white metal lined, are fitted to the crossheads, and the guide plates are both water-cooled and adjustable. Large doors are fixed on the back of the engine, giving easy and convenient access to the reciprocating parts and bearings. The front of the engine is completely enclosed. The working pistons are water-cooled, the water being passed in and out through telescopic tubes without stuffing boxes. Cranks are at 90 degrees, except the scavenging pump crank at the forward end of the engine. The scavenging pump is double-acting, and is controlled by a piston valve driven through a Stephenson's link motion, which simplifies reversing.

As a sort of crosshead to the scavenging pump, there is the low-pressure piston of the compressor immediately beneath, and the two higher stages of compression take place at the side in superimposed cylinders, the pistons of which are driven by balanced levers off the connecting rod of the bigger pump mechanism. Automatic valves being provided in the compressor, there is no need for a reversing device in connection with it. The scavenging air enters the cylinder through two rows of horizontal ports at the bottom, the lower row being controlled by the piston alone, while the upper is regulated by scavenging valves before it is covered by the piston. Through the upper ports a positive control is obtained over the quantity of air sent into the cylinder after the lower row has been covered. The scavenging valves are directly operated from the underside of the camshaft. Opposite the scavenging ports and equal in depth to both rows approximately are the exhaust ports leading to a water-cooled pipe. It is to be observed that in this design there are only the injection and starting valves in the cylinder covers, simplifying the heads and reducing very considerably the multiplicity of valve-operating mechanism and reversing gear. Two small air engines operate the maneuvering mechanism, one serving to carry through the displacement of the valve gear for running, starting and stop-

ping, and the other being used to alter the timing of the camshaft and of the scavenging pump valve to suit the reversed direction of running. The well-known eccentric mounting of the fuel and starting valve rockers in differential fashion is employed to give the change-over from air-power to fuel-working, and this is independently carried out for the cylinders in pairs.

Sequence of Operations

The sequence of operations in the regulation of the motor is simple and easily understood. When the engine is at rest the valve rod rollers are clear of the camshaft. When the first maneuvering engine is turned—which can be performed by hand in the event of the failure of the pneumatic gear—the camshaft is set for the desired direction of running, say ahead; the scavenging pump valve links are set similarly by the weight-shaft seen in the fore front of the engine illustrations; the starting valve rods are lifted over the ahead cams; and the movements automatically performed by the first wheel are complete. When the second wheel is turned, the two top shafts in line carrying the rockers of the valves are rotated to bring the starting valve rod rollers down on their cams, and air is thereby admitted to the cylinders in turn. A further turn of the wheel lifts two of the starting valves out of action, and the rotation of the top shaft which effects this has for further result the bringing of the corresponding two fuel valves into gear; the next operation is the final turn of the wheel to rotate the second top shaft and bring down the two fuel valves of those cylinders while lifting the starting valves away. Just below the two maneuvering wheels is the lever which controls the quality of fuel admitted to the cylinders and so regulates the speed of the engine. To reverse the engine, the two wheels are brought back to "stop," and then carried round in the opposite direction one after the other. The first wheel alters the timing of the camshaft by lifting the vertical geared shaft, reverses the links of the scavenging pump valve, and sets the starting valve rods over the astern cams. The second wheel then performs the same sequence of movement as previously described. The whole of the operations are achieved automatically. A further control over the running of the engine is given by the little hand-wheel at the side of the two maneuvering wheels, the turning of this serving through an appropiate connection of rods and links to advance or retard the fuel valve rollers and so alter the period of opening of the injection valve. A governor is fitted on the end of the camshaft to operate direct on the fuel pumps on the slightest increase of maximum speed.

Balance levers drive the pumps for the various services, the drive being taken off the cross-heads of both No. 1 and No. 4 cylinders. They supply cooling water for the working cylinders, pistons, compressor-cylinders, and intercoolers.

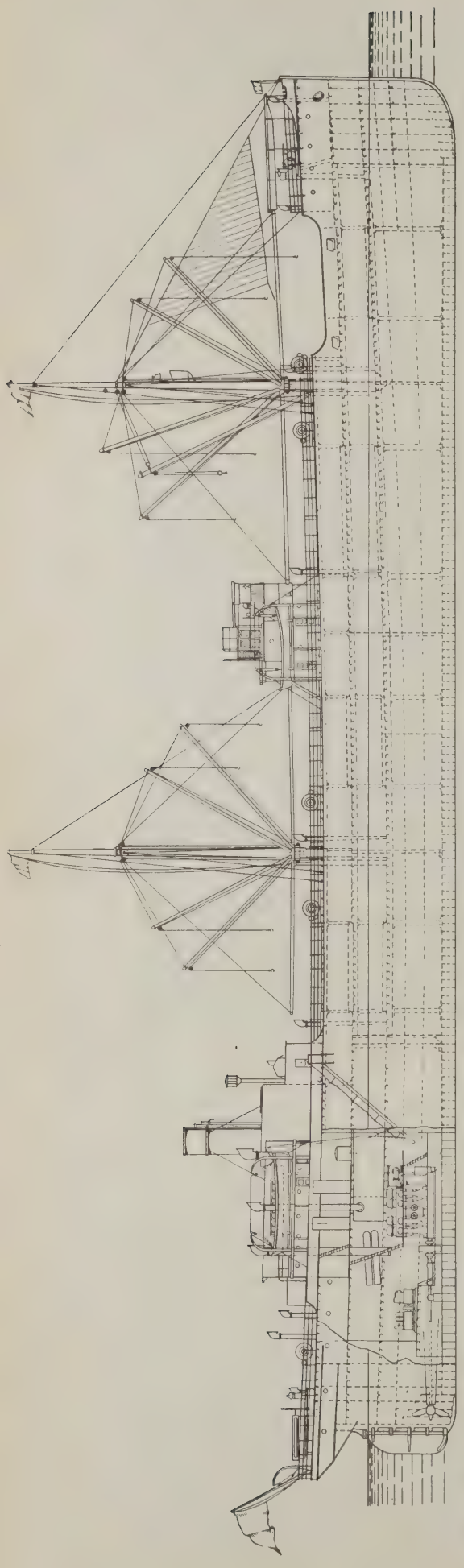
Auxiliary Machinery

The auxiliary machinery consists of two three-cylinder four-stroke Sulzer-Diesel engines of 50 H. P. They have cylinders 205 mm. by 220 mm., and run at 425 revolutions per minute. One is coupled direct to a dynamo which serves for the lighting of the ship; the other drives a compressor for use in case of emergency or failure of the ordinary supply, but particularly for use when entering or leaving port, when large quantities of air may be required for maneuvering. In these little engines the frame is built in two parts and is of box form, strengthened internally by columns. They are enclosed by light steel plates. On the cylinder heads are the starting, inlet fuel, and exhaust valves, operated through vertical rods by cams mounted on a shaft enclosed in the frame. The fuel pumps are driven direct by the crankshaft, and there is an adjustable governor which works by the general method of lifting the inlet valves of the fuel pumps. The oil pump for the forced lubrication is cast in one with the fuel pumps.

The remainder of the machinery of the ship consists of an electrically-driven ballast pump, delivering 120

THE AFTER WINCHES AND DERRICKS OF THE MONTE PENEDO

THE MONTE PENEDO FROM ASTERN



INBOARD PROFILE OF THE MONTE PENEDO

tons per hour; a 10-H. P. steam engine, which can be coupled to a dynamo or to a compressor; a steam-driven ballast pump delivering 40 tons per hour; a donkey boiler housed on deck and serving to supply steam for the deck machinery, as also for the steering engine when nearing port—at other times the steering is worked by compressed air at 105 lbs. per sq. in.—a boiler feed pump; and a fuel pump which supplies the same sort of fuel to the donkey boiler as is used in the main and auxiliary Diesel engines. About 650 tons of fuel is carried in the bunkers forward of the engine room.

The Howaldtswerks at Kiel, who constructed the ship, and Sulzer Bros. of Winterthur, who built the engines, have done their work well. The trials were very brief, and a fortnight after the first run the Monte Penedo left Hamburg on her first voyage to South America. It is anticipated that she will be diverted from her intended service in order to evade the high price of fuel oil in Europe at present, and that she will accordingly call at some United States ports.

Launch of Collier Middlesex

The New York Shipbuilding Co., Camden, N. J., launched on Sept. 2, the steel collier Middlesex for the Coastwise Transportation Co., Boston, Mass. The Middlesex is of the following dimensions:

	Ft.	In.
Length between perpendiculars	377	4
Beam, molded	50	
Depth, molded	32	
Draught, loaded	25	
Cargo carried at this draught, tons	7,250	
Gross tonnage, tons	4,730	
Speed at sea, loaded, knots	10	

The vessel has a single deck of steel, with poop 80 ft., bridge 17 ft., and forecastle 34 ft. long, seven steel watertight bulkheads, two pole masts, straight stem and semi-elliptical stern. A deep double bottom is fitted all fore and aft for the carriage of water ballast, and particular attention has been paid to the construction of this part of the vessel; the plating being of extra strength and fitted flush; no wood ceiling is fitted. The five cargo holds are entirely clear of beams and pillars, the deck being supported by deep arched beams and web-frames placed midway between the watertight bulkheads; a continuous trunk, 24 in. deep by 30 ft. wide, is carried on the upper deck for the full length of the cargo space. Large steel cargo hatches are in the top of this trunk, 11 in all. Six steam winches are fitted in connection with five pairs of king posts for raising the hatch covers and securing them in place when open. A cargo boom is located on the fore mast for handling stores, etc. The coal bunkers are at the sides of the vessel in the boiler room and in the poop 'tween decks, with hatches on the poop deck and pockets leading to the fire-room. The peaks are both arranged as water-ballast tanks. The accommodations consist of a midship deckhouse on the bridge deck for the captain's stateroom and spare room, with a pilothouse over; the saloon officers' and petty officers' berths, pantry, toilet, etc., are in the bridge; the engineers, cooks, steward, messrooms, refrigerator, toilets, galley, etc., are in the houses on the poop deck, and the oilers, seamen and firemen are berthed in the poop abreast the engine casing.

The steam windlass is fitted with warping ends and located on the forecastle deck, with the engine below in forecastle. The steam capstan is on the after end of the poop deck, with the engine below. The steam steering gear is on the upper deck abaft the engine casing, with connection to the steering stations in pilothouse and on navigating bridge; auxiliary hand-steering wheels are also provided. The propelling machinery is placed aft, and consists of one triple-expansion, inverted reciprocating engine of about 2,100 I. H. P., and two single-ended Scotch boilers having a working pressure of 175 lbs. The vessel is intended for the coastwise coal-carrying trade between Baltimore and Boston. Loading and discharging gear is not fitted on board, the two terminal points being arranged with these facilities.

Johnson Iron Works

The Johnson Iron Works, Ltd., New Orleans, La., are building a sternwheel towboat to be known as the Mariano Escobedo. The hull is of galvanized steel, 87 ft. long, 24 ft. beam and 4 ft. deep. The engines are fore and aft compound, 7½ and 15 by 36 in., surface condenser, with independent air and circulating pumps. The boiler is of the firebox type, supplied with independent feed pumps and injector. The boat will have accommodations for twenty passengers, the cabin being finished in mahogany. The company is also building a steel sternwheel towboat for the United States Mississippi River Commission, 116 ft. long, 28 ft. beam and 5 ft. deep, fitted with fore and aft compound engine, 12 and 26 by 32 in., with jet condenser, three horizontal boilers, externally fired, duplicate feed pumps and injectors and electric light plant.

Naval Collier Orion

Description of a Vessel Which Was Constructed in Record Time by the Maryland Steel Co.

THE elapsed time from the laying of the keel to the launching of the collier Orion for the United States navy at the yard of the Maryland Steel Co., Sparrows Point, Md., was five months and 17 days. The vessel was completed in nine months and three days, a very creditable performance.

The Orion, like her sister, the Jason, now nearing completion, has an overall length of 536 ft., length from forward side of stem to after side of rudder post 514 ft., beam molded 65 ft. and depth molded of 39 ft. 6 in. The vessels are classed A-1 for 20 years under the American bureau of shipping.

NAVAL COLLIER ORION

The Orion is built on the Isherwood patent system of longitudinal construction, with the propeller machinery in the stern. The cargo is carried in six large holds, which are clear of stanchions and by means of the topside tanks the coal is self-trimming. Five holds are fitted with two hatches each, and the forward one with but one hatch. Forward of the cargo holds under the lower deck are four deep tanks for carrying cargo fuel oil. The inner bottom under holds is also fitted for cargo oil and with the deep tanks has a combined capacity of 772,400 gallons. The topside tanks extend the length of the holds, and are for water ballast only. The feed water is carried in the inner bottom under the engine and boiler rooms. The coal bunkers have a combined capacity of 2,246 tons and are fitted at each end and over the boiler room with a reserve bunker on the berth deck outboard of engine room casing. The coal bunkers were designed with special attention towards eliminating trimming. A trimming tank is built between the after peak tank and after engine room bulkhead. Two domestic tanks of 20 tons total capacity are carried on lower deck aft of engine room.

The contract requirements of handling 100 tons of coal out of each hatch per hour created such enormous stresses that a decided departure from the usual mast and booms was necessary, and the builders decided that the same design of coal-handling apparatus they developed for the collier Neptune would be satisfactory. The builders' wisdom in regarding this problem strictly as a coal-handling proposition and not as a matter of appearance, was borne out when the operator handled over 137½ tons of coal per hour at the official test. This test took place upon the completion of the 48-hour run at the Norfolk navy yard, the operator raising the bucket to a specified height and distance outboard of the collier's side. The coaling booms are of built-up type, and are designed for handling continuously a working load of 7,500 lbs. under service conditions. To handle all the buckets, 24 Lidgerwood winches are installed, two of which are of special design with double drums for operating the fore and aft trolley.

The deck machinery is composed of a Hyde steam pump brake windlass with two gypsy heads fitted for warping, and engines located on deck below. A Hyde capstan is fitted aft on the poop deck with cylinders enclosed in base. The steering gear is a Hyde right and left screw gear type, fitted with three wheels of hard wood for hand steering, and operated by a steam steering engine controlled by telemeter operated from bridge.

The crew of 152 men are carried in 'tween decks forward and aft and twenty-five officers are quartered in deck house on poop deck. The crew's

quarters are finished in red cypress, the officers' and captain's quarters and dining saloon in white pine and white oak. Mess rooms and warrant officers' quarters in white pine and red cypress. Bridge house in red cypress and white oak. Trim in galley, pantries and bakery of ash. Screen doors and windows are fitted in officers' quarters. Venetian doors to inside of all entrances to officers' quarters. Steel bulkheads are fitted around showers, water closets, pantries, galley, bakery and lavatories.

The floors of the galley, bakery and pantries are covered with a non-porous tile, officers' lavatory with white vitrous tile and the crew's lavatory with asphaltum cement. Linoleum is laid in walking spaces of crew's quarters and necessary spaces and throughout in petty officers' quarters, hospital and officers' quarters.

Fowler & Wolfe radiators are installed throughout the ship, with system drainage through trap to filter box or condenser. Two Sturtevant direct-connected generating sets of 25 kilowatt capacity are installed for lighting the vessel, and operating a 24-in. searchlight. Inter-communicating telephones are installed in captain's room, on lower bridge, aft on poop deck, chief engineer's room and engine room. The wireless apparatus has a radius of 200 miles.

A feature that was observed on the Orion was that the deflection due to the load was 71 per cent less than that observed on the collier Neptune under similar conditions. The deflection taken from the above percentage was the maximum in both ships and was taken at the same point. The cargo on both ships at the time the deflection was read was 10,500 tons of coal, 2,000 tons of bunkerage coal, 120 tons of feed water and 130 tons of stores and crew.

Propelling Machinery

Due to saving in weight of structure resulting from the use of the Isherwood system, the Orion carried the specified deadweight on a draught of 26 ft. 10½ in. in place of 27 ft. 7⅝ in. as required by contract. This saving means an increase in deadweight of over 500 tons, or an additional earning capacity of 4 per cent on the same initial cost and the same operating expense.

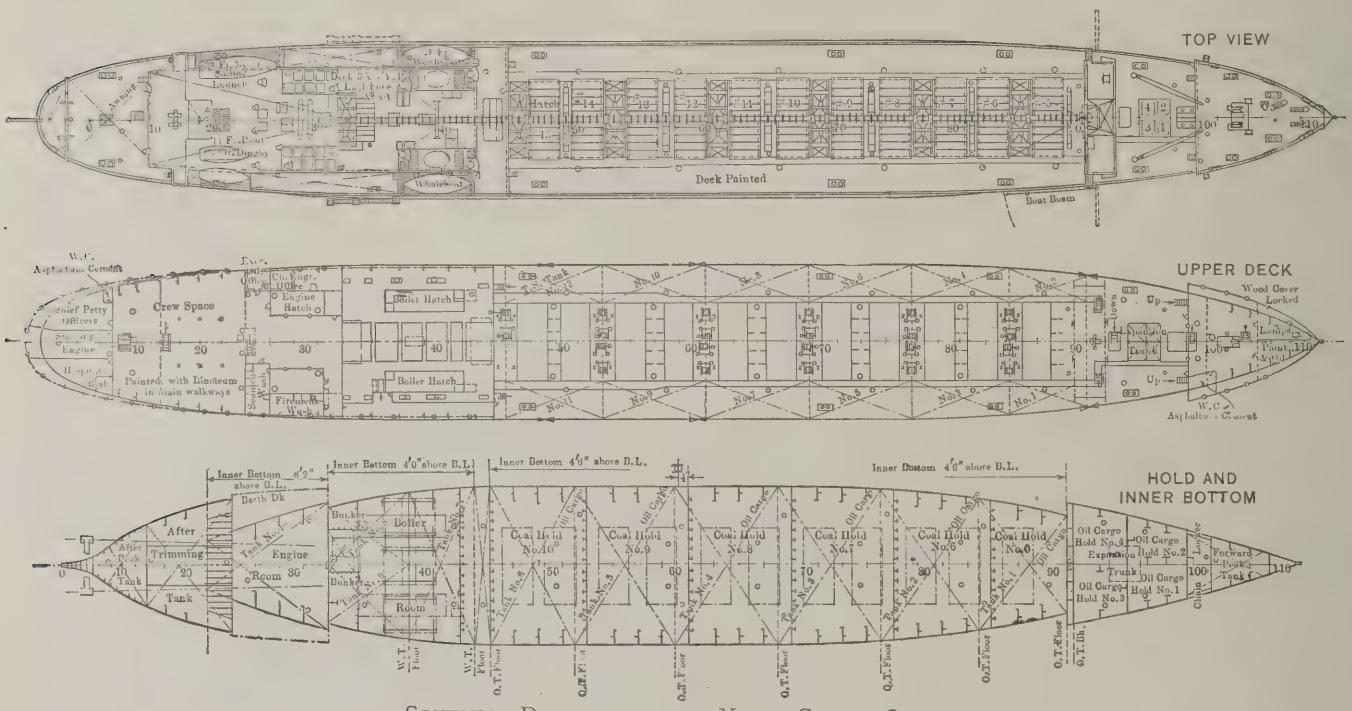
The propelling machinery of the Orion represents the highest class merchant type. The two main engines were designed with special reference to economy and are of the three-cylinder, triple-expansion type. The cylinders are 27, 46 and 76 in. in diameter by 48-in. stroke, designed for a working pressure of 200 lbs. per square inch. All cylinders are fitted with piston valves. The crank shaft is 14¾ in. in diameter in two pieces. One main air pump, two bilge pumps and an oil pump for forced lubrication to thrust block, are direct connected to each main engine. The main condensers are independent of the main engine framing and are located just outboard of each main engine.

As the machinery is in the stern there is only one length of line shaft. The propellers are of the three-bladed built-up type, with cast steel hubs and manganese bronze blades. They are 16 ft. 6 in. in diameter and 18 ft. mean pitch and the trials of the Orion demonstrated that these wheels admirably suited the required conditions.

There are three double end Scotch type boilers operating under the Howden's system of forced draft. Each boiler is 15 ft. 10½ in. mean diameter by 21 ft. 4 in. long and contains eight 40-in. inside diameter corrugated furnaces. The total heating surface is about 18,900 sq. ft. A donkey boiler 8 ft. diameter by 10 ft. 4 in. long constructed for 200 lb. working pressure and located in bunker between engine and fire rooms, is provided for port use.

The usual number of auxiliary machines have been provided consisting of two 14-in. centrifugal circulating pumps, three long stroke simplex feed pumps, a duplex fire pump, sanitary and fresh water pumps, two large evaporators with pump, two distillers with pump, an auxiliary condenser with attached pumps for port use, a pressure type feed water heater, two forced draft fans and a two ton refrigerating plant. As the double bottom carries cargo oil or ballast there are two duplex pumps in engine room cross connected to either service.

The 48-hour endurance trial run of the Orion which was started July 10, 1912, proved very successful, the ma-



SECTIONAL DRAWINGS OF THE NAVAL COLLIER ORION

chinery running smoothly throughout and showed the following results:

Revolutions per minute, average both engines, 95; average steam pressure at boilers, 195 lbs.; average steam pressure at engines, 192 lbs.; average air pressure in ash pit, 1 in. water; average indicated horsepower both main engines, 6,943; average speed for run, 14.468 knots.

Tug Richard Fitzgerald

The Chicago Lighterage Co., of Chicago, have had turned over to them recently the new harbor tug Richard Fitzgerald, named for the president of that company, and her attractive appearance is drawing a great deal of attention about the Chicago river. The principal dimensions of the Fitzgerald are: Length overall, 92 ft., beam 22 ft., and depth 12 ft.

The tug is built completely of steel, exceptionally heavy in all parts, and designed for particularly hard service. The frames are heavy and close spaced, and the lightest shell plating is ⅜ in. thick. The water line strake is doubled practically the full length, making a belt ¾ in. thick. Where the bow plating is not doubled the plate is ½ in. thick, as is also the shear strake. A deck stringer ½ in. thick runs completely around the boat. The balance of the deck is ¼ in. blind punched to insure a foothold.

The deck house is steel throughout, flush riveted and 4-in. pilasters divide the surface into panels. The pilot house is ceiled in yellow pine and contains a large seat and two lockers. The engine room is ceiled throughout, as is also the forward and after holds. A galley, completely equipped, is in the forward hold, and the sleeping quarters, with steel berths, are in the after hold.

The rudder is very heavy with a 7-in. stock and double cast steel tow posts are installed aft and a single post forward.

The power plant consists of a fore and aft compound condensing engine with cylinders 18 and 38 by 30-in. stroke, swinging an 8 x 9 in. cast steel wheel.

The stern tube is cast iron and has a removable bronze bushing in halves, filled with lignum vitae, arranged for easy removal. This is the same type of tube that is used on large ships. An independent jet condenser is installed and the other auxiliaries consist of a main feed pump, a pony pump, and a heater. The exhaust steam is led into the hot well, heating the feed water before it is passed through the heater, giving the highest possible temperature for the feed water. All valves are operated from the handling platform and the engine room is fitted up with a full set of gages, mounted on a board. The latest type of Metropolitan injector is installed. An automatic relief valve in the exhaust pipe allows atmospheric exhaust in case the water supply is choked up by ice or other matter.

THE TUG RICHARD FITZGERALD

The boiler is a Scotch marine type, 13 ft. diameter by 12 ft. 6 in. long, carrying 180 lbs. of steam, and is fitted with three 42-in. Morison furnaces. A 6-in. ash gun is installed in the fireroom. An athwartship coal bunker and two side bunkers give ready access to the coal and hold a supply of 55 tons.

The steering gear is the Elmes type, located in the engine room and operated by a lever in the pilot house.

The electric light plant has sufficient capacity to light all parts of the boat, including the running lights. In every way the Fitzgerald is completely equipped with all the outfit and accessories necessary for a first-class tug.

The Fitzgerald was designed and built by the Manitowoc Shipbuilding & Dry Dock Co., at Manitowoc, Wis., and this company is now working on a tug of the same size for a Milwaukee company.

Oil Burning Steamers

Some 250 steamers have been recently adapted for burning oil-fuel, the largest being Toyo Kisen Kaisha liners Tenyo Maru and Chiyo Maru, of 13,454 tons and 13,431 tons respectively. The new Cunard liner Aquitania, of 50,000 tons, in course of construction on the Clyde, is to be similarly equipped, while a White Star boat, of 18,000 tons, which is now being built at Belfast for the Cape and Australia route, and which is to be named the Ceramic, is also to use oil. Quite a large number of oil-burners are now employed in the Pacific; two of them, the Ventura and Sonoma, recently inaugurated a service for the Ocean Steamship Co. between San Francisco and Sydney, New South Wales. Another line of steamers burning oil-fuel, the Crown Line, will soon be running between Pacific Coast ports and Australia. The Southern Pacific is also converting all of its steamers into oil burners.

Hendricks' Commercial Register

The twenty-first annual revised edition of Hendricks' Commercial Register of the United States has just been issued. This is a compilation of architectural, engineering, electrical, mechanical, railroad, mining, manufacturing and kindred trades and professions. It is intended to establish a direct link between the buyer and seller. The total number of classifications in the book is over 50,000, and there are upwards of 385,000 names and addresses. All manufacturers of a particular trade are first classified under a general heading for mailing purposes, and then each firm is published under as many classifications as every variety of their products call for. The book contains 1,419 pages, with an elaborate index of 122 pages. It sells for $10. S. E. Hendricks Co., 74 Lafayette street, New York, are the publishers.

The steamer John A. Hooper, building for Sudden & Christenson, of San Francisco, Cal., was launched at the yard of the Harlan & Hollingsworth Corporation, Wilmington, Del., on Sept. 23. The Hooper is 300 ft. long, 44 ft. beam and 21 ft. deep.

Motor-Driven Ship Christian X

The First Deisel-Engined Vessel to Reach New York—In the Hamburg-American Line Service—Visit to Her Engine Room

THE motor-driven ship Christian X of the Hamburg - American Line, attracted a great deal of attention at New York last month. She was built and engined by Burmeister & Wain, of Copenhagen, for the East Asiatic Co., but was purchased by the Hamburg-American Line upon her arrival at Kiel. Her original name of Fionia was then changed to Christian X. While at Kiel she was visited by the kaiser, and is the first Diesel-engined ship to fly the German flag.

Christian X is 386 ft. long, 53 ft. beam, 30 ft. deep, with a draught of 23 ft. 6 in. Her deadweight carrying capacity is 7,400 tons. Her total horse power is 2,500, which is developed by two sets of Diesel engines of the four-cycle type, each having eight cylinders.

On the way across Capt. Robert Niss says that he was queried by nearly every ship as to what he had done with his smoke stacks. The new vessel has no funnels, the gases of combustion passing through apertures in the upper part of the mainmast and the smoke from the galley fires through the mizzen mast, both being constructed of hollow steel.

John J. Bogart, consulting engineer to the New York Engine Co., visited the ship at Hoboken and writes very entertainingly concerning the vessel, as follows:

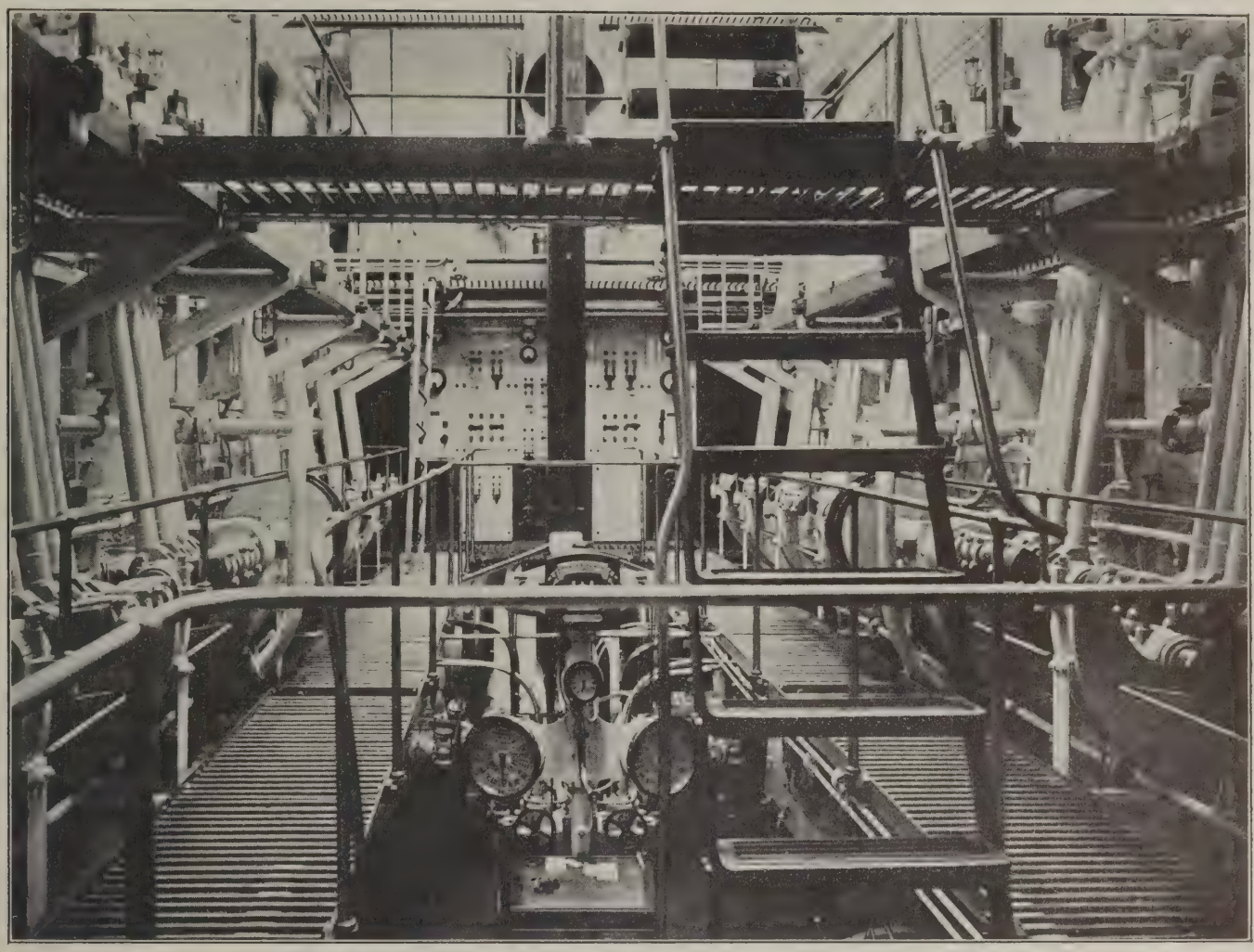
"The steamship requires recoaling four times to circle the globe if she carries coal in her bunkers. The oil ship circles the globe with what she can carry in her double bottom. A fuel consumption of between nine and ten tons for each day of 24 hours at full speed, when fully loaded, makes possible for the Christian X, which has just completed 12,000 miles, a continuous voyage around the world without replenishing her supply. Over 900 tons of oil can be run into her tanks lying wholly below the cargo space. A steam engine ship would consume between 40 and 50 tons of good steam coal per day of 24 hours, would require bunker space above the level of the fire room floor, would require coal trimmers, firemen, and water tenders, all of whom are dispensed with in an oil-engine ship. Considering that this was a maiden voyage, considering the prodigious distance traveled, that this type of propelling machinery has no more than 10 years experience behind it, that the engine force of ten men and three boys had no opportunity to acquire previous experience at sea with the Diesel motor engines, the results attained are surely remarkable.

"Through the courtesy of the resident manager of the Hamburg-American Line, and in company with a representative of the United States navy, I was kindly permitted to study the working and details of the machinery of the Christian X, being in the engine room from the time the ship left the dock at Hoboken till she slowed down near the lightship to discharge her pilot. Let the layman picture to himself four enlarged automobile engines, coupled together in pairs, driving two propeller shafts, and he will get a faint idea of what the main engine installation looks like.

THE HAMBURG-AMERICAN MOTOR-DRIVEN LINER CHRISTIAN X

Each of the 16 power cylinders is about four times as large in diameter as the largest automobile cylinder he is familiar with—or, to be more exact, 20⅞ in. in diameter. The stroke of all the 16 pistons is 28¾ in. and the total horsepower indicated at sea under normal conditions is very nearly 2,500.

"Of course, these are not gasoline engines, but fuel oil engines, and utilize what is left of petroleum after the gasoline and kerosene have been removed by distillation. Gasoline is unsuitable for marine power plants. The volatile nature of gasoline makes any leak from pipes or tanks extremely dangerous, while residual oil is safe from the possibility of forming an explosive mixture with air. So for reasons of safety as well as economy the



ENGINE ROOM OF THE HAMBURG-AMERICAN MOTOR-DRIVEN LINER CHRISTIAN X

heavy, non-volatile petroleum distillates are alone suitable for the production of power at sea.

The Marine Steam Engine

"There are many other points to be considered before one can be bold enough to contemplate the relegation of marine steam engines to the scrap heap. When launched the Christian X bore the name Fionia, and was one of three motor ships ordered from Messrs. Burmeister & Wain of Copenhagen, the other two being the Selandia and the Jutlandia, all three being engined with Diesel oil engines of Messrs. Burmeister & Wain's own design, Denmark taking the lead of all Europe in the production of a 10,000 tons displacement motor ship, engined with upward of 2,500 I. H. P. of oil engines when ships of about half the size and half the power only had been turned out by other builders.

"The Selandia was the first one of these motor ships to be put in service, and a considerable amount of information relating to her performance on one of her regular voyages of 21,840 miles is now available.

"A careful inspection of the engine room log of the Christian X, which the chief engineer of that vessel so kindly placed at my service, convinced me that this motor ship is in every way the equal if not the superior of the Selandia. The Selandia belongs to the East Asiatic Co., and it was from them that Herr Ballin, so well known for his enterprise, bought the Fionia for the Hamburg-American Line after having witnessed her successful trials at Kiel during the latter part of June of this year. During the Selandia's maiden voyage out to Bangkok and return she stopped at 16 ports, encountered practically all kinds of weather, and all hands aboard ship appear to be a unit in declaring that she proved herself thoroughly reliable and free from those troubles that usually crop out with a new ship and new engines. Twice on the voyage the pistons were withdrawn to examine the rings and the cylinder walls, and twice on the voyage the valves were taken out and examined. No cylinder wall was found scored or worn, one or two of the piston rings needed a little paraffine to free them and the exhaust valves, which have cast iron heads on steel stems, in a few instances needed cleaning and refitting.

Selandia's Performance

"There is a little matter of at least $350 per month saving in food and wages for the fireroom force. An oil-engined ship is more expensive to build and equip than a steam-engined ship. In the case of such 10,000-ton vessels as the Selandia and Christian X, the difference is as much as $50,000. The East Asiatic Co. of Copenhagen, the concern for whom these two vessels were built, estimated that there would be a saving of some $25,000 per annum for each ship if engined with Diesel motors in place of steam engines. Each ship is supposed to make three round trips or voyages from Copenhagen to the Far East via the Suez canal in that time. They calculated also upon a gain of 1,000 tons in cargo space, which represented to them not less than $5,000 per voyage, or $15,000 per ship per annum. If the calculations of the owners are correct the extra cost of these 10,000-

ton motor ships will have been earned and written off within 18 months.

"Reversing from full ahead to full astern takes some 20 seconds, and the tanks for holding compressed air are of sufficient capacity to permit the starting of an engine 30 times or both engines 15 times without renewal of the supply. Two four-cylinder Diesel oil engines of 250 H. P. each drive electric generators that furnish the electricity needed to light the ship and operate all the auxiliaries, including the steering gear. A donkey boiler furnishes steam to a small steam engine that is directly coupled to a Reavell compressor if by any possibility the need for such a service should arise. Because 16 separate complete engines make up the two main engines, the carrying of spare parts is greatly simplified. An extra exhaust valve for each cylinder, because it is considered good policy to change these details every 20 days, is the most noticeable spare part.

"Altogether the impression made on me from my sojourn in the engine room during the short time that elapsed between leaving the dock in Hoboken and discharging the pilot off the lightship was distinctly favorable, and a careful perusal of the engineer's log disclosed conditions in sea service that strengthened the conviction that marine history is being written by the advent of the Diesel engine."

Marine Gas Engines

Holzapfel I, the first sea-going gas-driven vessel, which resumed her work in April last, has since completed ten voyages in the coasting trade, and these have been performed without accident. Her last voyage terminated in the Tyne in the early part of August. Although the work performed during the present year was quite satisfactory, the owners have come to the conclusion that the general arrangements of the vessel are such as to militate against her continued successful working. The gas plant and donkey boiler were placed on the engine room flooring, and the heat and dirt from these were such as to make the work of the engineers in the engine room very difficult and uncomfortable, and the owners have now come to the conclusion that the only correct place for the gas plant is in a separate space above the water line. One of the reasons why the gas producers were placed below the water line had been in order to have a 'tween deck bunker, from which the coal could be fed into the producers automatically by gravitation, and, while this worked in quite a satisfactory manner, the position of the producers was so cramped that stoking and clinkering could not be efficiently carried on.

The space on deck in which the owners propose to place gas producers, etc., in future, will be considerably less cramped, and will make all these operations quite easy. Special ventilating arrangements for the space in which this plant is contained will also be made. Unfortunately the Holzapfel I is so constructed as to make an alteration of this nature practically impossible, particularly as to raise the gas plant above the water level would probably reduce her stability below the safety margin, and the owners have consequently decided to take out the machinery and to sell the hull. The vessel has in all performed 19 voyages since she was built, and has shown what are the difficulties in the adaptation of gas plant and gas engines for marine purposes. A valuable lesson has been learned by her working, and it is sincerely to be hoped that this will not be lost, but that other vessels will soon be built, profiting by the experience of the past and giving further and unquestionable proof of the economy, efficiency and safety of marine gas engines.

Two Oil Fishing Schooners

On the Pacific coast of Canada, the long, narrow reaches of the inside route from Seattle and Vancouver to the halibut grounds off the coast of Alaska have made the sails of the fishing schooners employed in the halibut industry an almost useless part of their equipment during the major portion of their trips. To overcome this difficulty, many of these boats are equipped with auxiliary power; but it has remained with the New England Fish Co. to take the longest step forward in the industry. This firm's headquarters are at Boston, but they have important offices in New York, Seattle, Vancouver and Ketchikan, Alaska.

They are now having built at the yards of Arthur D. Story, in Essex and Gloucester, Mass., two sister schooners of a modified knock-about type, 125 ft. over all, 102 ft. load water line, 24½ ft. beam, with a mean draft of 10 ft. to be powered with two 100 H. P. Blanchard oil engines, operating twin screws, and developing a speed under power alone of about 10½ miles an hour. They will have plain pole masts with no top masts, and the sail area will be cut down to 4,500 sq. ft., less than one-half that with which boats of this size would be normally equipped. Briefly, the sails are to be used only as auxiliaries to the engines, which are a late development by the Blanchard Machine Co. under the direction of Wolcott Remington. They are of particular interest in that they will use for fuel a low grade, asphaltum base oil that is put out by the Standard Oil Co. on the Pacific coast as Star fuel oil. It costs only a dollar a barrel in Seattle, and its high-flash point makes it as safe as coal.

It is planned to launch the two schooners in October, and after the engines have been installed and the rigging and outfitting completed, they will proceed to Seattle via Cape Horn, arriving there in time for the early spring work.

The schooners were designed by Thos. F. McManus, of Boston. He has been prominently connected with the New England fishing industry for 14 years, 13 years as an active participant and the remainder as a designer of fishing schooners, and in that time has built and designed over 300 vessels.

The original type of fishing schooner was shallow draught with long bowsprit and jib boom and very long main boom, giving it a long sail base line extending far outboard, making the work of handling sails in heavy weather exceedingly dangerous. In fact, the chance of wreck in storms was one of the most serious that fishermen of those days took; but now all this has been changed, and the production of Mr. McManus, several years ago, of the knock-about type with its deep and sharp hull lines, short sail base, and eliminated bowsprit have made these boats safe and easy to handle in heavy seas. There is less pitching and great saving of wear and tear on the rigging, no bobstays to leak, no bowsprit to loosen, and with practically no overboard work for the men to do in handling sails; they now fear only fog, collision and shore.

On the Pacific coast the need for this step has been imperative and the results achieved by these vessels will be watched with interest, not alone there, but on the Atlantic coast as well, for the increasing need of power is being strongly felt by the Boston and Gloucester fishermen, as a delay of a few hours in landing at T wharf may mean a decrease of hundreds of dollars in the price they obtain for their catch.

The Chesapeake Steamship Co. has awarded contract to the Maryland Steel Co. for two freight and passenger steamers for service between Baltimore and Richmond.

Two Great Floating Docks

The Enormous Structures Which Have Recently Been Turned Out in British Yards for the British Admiralty

EARLY this year Swan, Hunter & Wigham Richardson launched this great floating dock from their Wallsend yard. A great deal of interest has been taken in the dock, not only owing to its being designed to lift battleships for the British admiralty, but also because of its exceptionally large size, some idea of which may be gained when it is known that the dock covers an area of two and a quarter acres. Messrs. Clark & Standfield of Westminster were consulted in the preparation of the designs, their reputation for floating docks of all types being known in every quarter of the globe.

VIEW OF MEDWAY DOCK FROM PORT WALL PLATFORM LOOKING FORWARD

Of the floating docks built in the United Kingdom, the majority have been turned out from the Wallsend ship yard of Swan, Hunter & Wigham Richardson, who have executed orders for the British admiralty, the governments of Natal, Southern Nigeria, Japan, and Spain; and also for numerous foreign clients in various parts of the world. During this year Swan, Hunter & Wigham Richardson have delivered three floating docks to the British admiralty, one for raising torpedo boat destroyers, another for docking submarines, and the great Medway battleship dock, herewith dealt with. The over-all dimensions of the Medway floating dock are 660 ft. long and 144 ft. wide. The clear width between the rubbing timbers at the top deck is 113 ft. The side walls are 66 ft. high on the outside of the dock and 46½ ft. above the pontoon. In length they are 520 ft. along the pontoon deck and 440 ft. at the top. The depth of the pontoon is about 20 ft. The weight of steel plates and angles worked into the dock is about 12,000 tons. The dock is designed to lift battleships of displacements up to 32,000 tons with a draught of up to 36 ft. The keel blocks of English oak are spread over a length of 640 ft. and the two lines of bilge blocks at each side cover a length of 280 ft.

The dock is of the so-called "box" type with two side walls. On the double bottom or pontoon proper there are two hollow walls running almost the full length of it. These side walls are permanently attached to the pontoon so that the dock cannot be taken to pieces in any way. This is roughly the difference between a "box dock" and docks which are "self-docking". The latter are so constructed that they can be detached in sections so that one part of it can be raised by the remainder of the dock for purposes of repairing, cleaning and painting. At the bow end of the dock there is a pair of flying gangways of lattice construction giving access from one wall to the other.

The mooring attachments are unusually large and strong so as to efficiently hold the dock in a tide-way. At each end of each wall there is a strong timber roller fender to help to guide vessels when being docked. The valve house is placed at the forward end of the starboard wall and from this point all the valves and pumping arrangements of the various compartments of the dock are controlled. In the valve house are two long tables on which are fixed a large number of pressure gages giving the height of water in the various compartments of the dock. The gear for operating the valves is on the Westinghouse electro - pneumatic system.

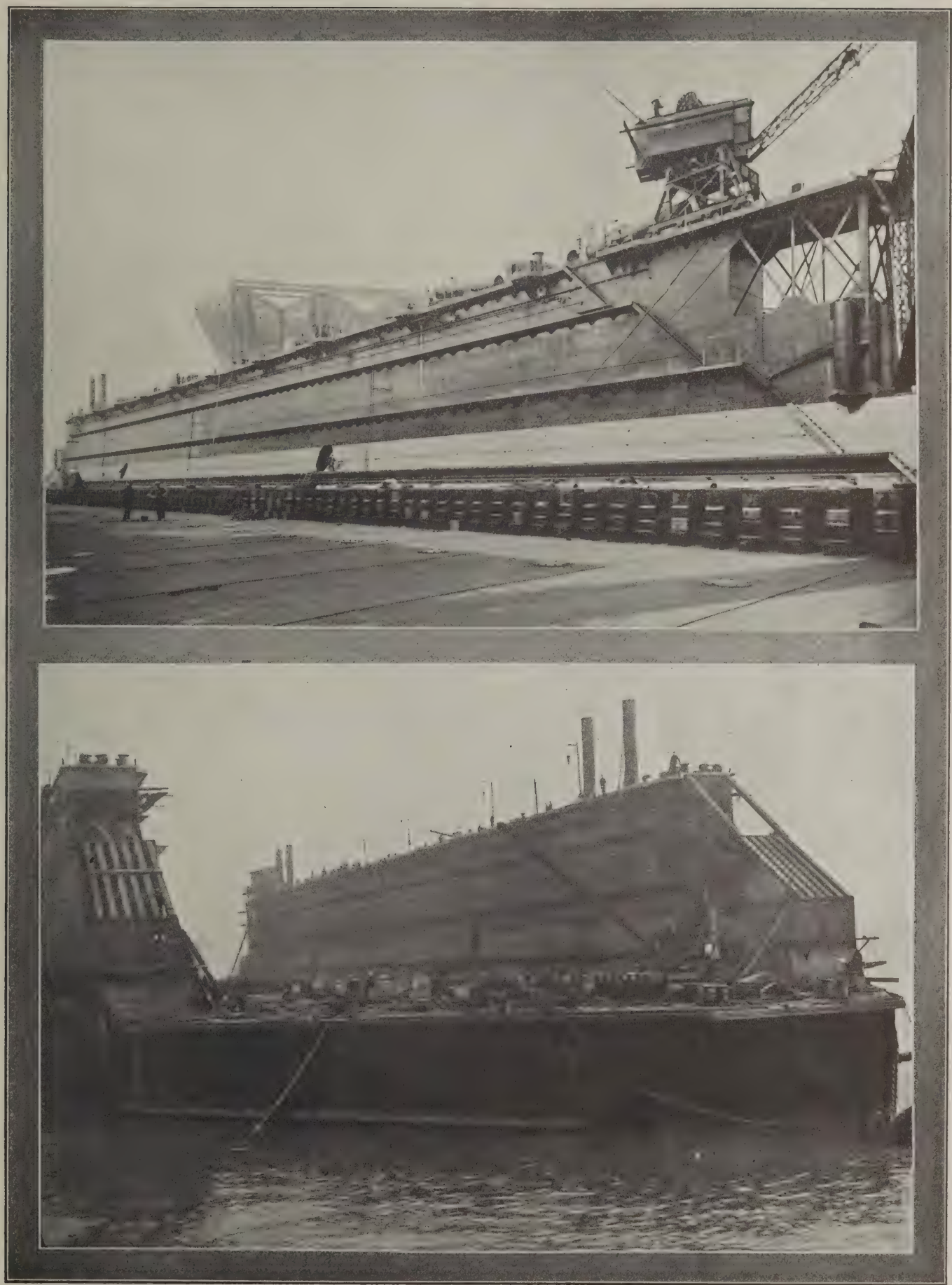
The bottom pontoon is divided both longitudinally and transversely by a number of watertight bulkheads, and the two side walls each have a watertight deck running their whole length. These bulkheads and decks divide the pontoon and walls into about 80 watertight compartments. These are grouped into sections, each of which has its own sets of valves so that it can be flooded or emptied independently.

Living accommodation, mess rooms, lavatories, etc., have been provided in the port wall for the dock master, petty officers, and dock crew.

At each end of each wall there are two steam boilers, making eight in all, which were built at the Neptune works of Swan, Hunter & Wigham Richardson. These boilers have a working pressure of 155 lbs. per sq. in.

The installation of pumping machinery comprises eight compound condensing engines driving centrifugal pumps at 275 revolutions per minute.

THE UPPER PHOTO GIVES A GENERAL VIEW OF THE MEDWAY DOCK ALONGSIDE THE WALLSEND SHIP YARD. THE LOWER PHOTOGRAPH SHOWS THE BOTTOM PONTOON PRACTICALLY FINISHED AND SIDE WALLS BEING ERECTED



THE TOP PICTURE SHOWS THE PORT WALL OF THE MEDWAY DOCK FROM THE INSIDE OF THE DOCK, SHOWING PLATFORMS, TRAVELING CRANES, ETC. THE BOTTOM PICTURE SHOWS THE DOCK JUST LAUNCHED, WITH TEMPORARY HEAVY TIMBER STRUTS TO TAKE LAUNCHING STRAINS

In each wall are also placed two direct acting steam pumps capable of delivering four hundred gallons of water a minute and these are used for fire and wash-down services.

On the top of each wall is a five-ton electric traveling crane with separate motions for revolving, hoisting, derricking, lowering, and traveling. Eight powerful steam driven capstans are fitted on the walls to warp ships into position. In each wall there is a dynamo room with high speed steam engines driving Westinghouse direct-current generators. Electric current is used for lighting, operating the valve gear, driving traveling cranes, and also the machinery in the workshops. Furthermore, power and light are to be provided for any warship that may be in the dock. In the starboard wall there is a fine range of workshops, comprising a forge, a lathe shop, machine shop and coppersmith's shop. They are all well equipped with a number of tools such as high speed lathes, boring and drilling machines, punching and shearing machines, an electro pneumatic power hammer, an hydraulic bending machine, planing machines, and forges.

In the walls of the dock there is also air compressing plant to provide power for the electro-pneumatic valve operating gear and also for a large complement of pneumatic tools.

From the foregoing it will be seen that this new admiralty dock represents the most efficient and complete means of overhauling and repairing battleships of the largest and most modern type.

The Portsmouth Dock

The great dry dock built by Cammell, Laird & Co., Birkenhead, Liverpool, for the British admiralty was successfully floated on Aug. 14, and safely delivered at the Portsmouth dock yard on Aug. 21.

The dock has been specially designed to accommodate the heaviest of our battleships and cruisers, having a lifting capacity of 32,000 tons.

It is unlike other floating docks on account of the structure being continuous for its whole length, with the side towers permanently attached to the pontoon, and is described as a box type dock, whereas the usual type is self-docking; this means that the pontoons are constructed in detachable sections so that each pontoon may be raised alternately for the purpose of examination and repair.

Displacement of 49,000 Tons

An idea of the great dimensions of the dock may be better appreciated when it is stated that the area of the bottom of the dock exceeds 2¼ acres, the overall dimensions being 680 ft. long and 144 ft. wide. The clear width at the top of the side towers is 113 ft. The side towers are 66 ft. high from the bottom of the pontoon and 46½ ft. above the pontoon deck level.

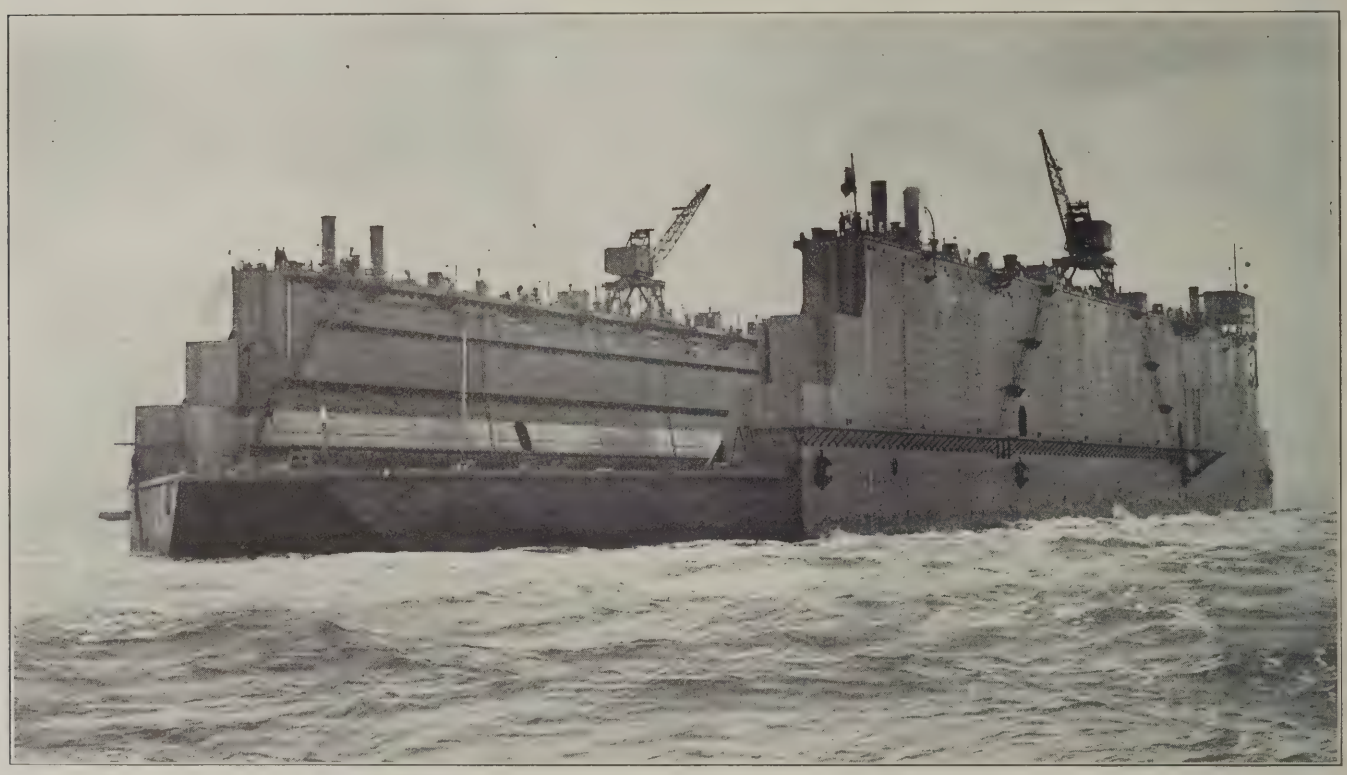
The total displacement of the dock when submerged to dock a ship having a draft of 36 ft. is 49,000 tons. The pontoon and side walls at the bottom of the dock are divided by transverse and longitudinal watertight bulkheads into 80 compartments. These are grouped into sections, each section having its own set of valves, so that any compartment can be floated and emptied independently.

The complete control of the dock is arranged in the valvehouse, where a table carrying a model of the dock indicating the separate compartments is fitted. Each compartment shown on the model has its own gages for indicating whether valves are open or closed and the depth of water in feet in each compartment.

For the former purpose the well-known Westinghouse electro pneumatic system is installed. It is based on the principle of operating presses by compressed air, and controlling the same from a distance by means of valves operated by electro magnets.

The positions of the valves are indicated back to the valve table by electrical means.

Each watertight compartment of the dock is provided with water level indicators in the valvehouse model. These indicators are in the form of an inverted cup in the bottom of each compartment. From the top of these cups or bells a pipe is led through the interior of the dock up



TOWING THE GREAT 32,000-TON DRY DOCK FOR THE BRITISH ADMIRALTY TO PORTSMOUTH HARBOR

to the valvehouse, where the pieces are fitted, one end of which is connected to an aneroid gage capable of reading by pressure from a 6-in. head of water to the highest head that can occur in the compartments.

The other leg of the tee communicates with a receiver pipe common to all indicators in the block, and such are governed by a small plug valve.

The receiver pipes are connected to a small air reservoir fitted with a hand pump. The pumping machinery is arranged in two identical installations, and situated one in the port and the other in the starboard wall, and is capable when combined of emptying the dock of water and lifting a vessel drawing 36 ft. and of a displacement of 32,000 tons within five hours.

The Pumping Machinery

The steam power for driving the main pumping engines and dynamos is supplied by eight watertube boilers, with a working pressure of 155 lbs. per sq. in., constructed at the works of the builders. Two of these boilers are arranged near each end of each side wall.

The pumping engines consist of eight compound condensing engines, each driving a set of centrifugal pumps of Messrs. Gwynnes' make. These are of the horizontal vertical spindle type, and are seated directly on top of the main drain running along the bottom of the walls.

Two direct acting steam pumps are placed in the condenser room for fire and wash-down service, the suction of these pumps being connected to the main drain of the dock so that they may be used as a drainage service for emptying any one particular compartment.

A dynamo-room is provided in each wall. This equipment of electrical machinery supplies current for driving the machinery in the workshops, the traveling cranes, the valve gear, and for lighting, etc., through flexible conductors. Power and light are also supplied to any warship that may be in the dock. In each wall of the dock there has also been placed an air compressor, providing power for a complete equipment of pneumatic tools, and also for actuating the electro-pneumatic valve operating gear.

In the starboard wall there is a fine range of workshops. These include a coppersmith's shop. These workshops contain a number of fine tools, such as high-speed lathes, boring and milling machines, and electro-pneumatic power hammer, a flanging machine, punching and shearing machines, forges, an hydraulic pipe-bending machine, and planing machines. In the port wall living accommodations, including mess-rooms, lavatories, etc., has been provided for the dockmaster, petty officers, and dock crew. On the top of each wall there is a 5-ton electric crane. These cranes have separate motions for traveling, revolving, derricking, hoisting and lowering. Eight powerful steam-driven capstans, supplied by Messrs. Harfield, are placed on the walls for warping ships into position.

Launch of the Potlatch

What is certainly the fastest piece of construction work ever done on Puget sound culminated in the launching of the steel passenger steamer Potlatch, at the yards of the Seattle Construction & Dry Dock Co. The Potlatch is an Indian name, meaning an annual feast and gathering of the tribes. The vessel was about 95 per cent completed when she was launched and as she went down the ways there was steam in her boilers, as shown in the accompanying photograph. The Potlatch blew herself a welcome with her own whistle.

LAUNCHING THE POTLATCH WITH STEAM UP

The dimensions of the Potlatch are: Length over all, 158 ft.; length between perpendiculars, 150 ft.; breadth, 27 ft.; depth, 8 ft. 9 in.; indicated horsepower, 750; contract speed, 13 knots. The vessel is equipped with a triple-expansion engine, two Seabury water-tube boilers and burns fuel oil, as do practically all steamers on Puget sound now. The Potlatch has twenty-eight state rooms and accommodations for sixty-two passengers.

The building of the Potlatch adds another unit to the fleet of the Inland Navigation Co. Two years ago President Joshua Green, of this company, announced that as the old wooden steamers outlived their usefulness, they would be replaced by fast and commodious steel vessels. Four vessels have been added since—Kulshan, Sioux, Sol Duc and Potlatch, all built by the Seattle Construction & Dry Dock Co.

The Seattle Construction & Dry Dock Co. will build two more steel vesels for the Inland Navigation Co., work having already been started. One of these will be the Tacoma, for the Seattle-Tacoma route. The Tacoma, whose dimensions will be 221 ft. over all, beam 30 ft. and depth 10 ft., will be built to a contract speed of 19 knots. She will be a day boat, and will have no staterooms. Her machinery will consist of a four-cylinder, triple-expansion engine and Ballin water-tube boilers. The second steamer, to be known as the Sockeye, will be a freighter.

The Alaska Pacific Steamship Co. has purchased the steamer Admiral Farragut from the American Mail Steamship Co., and will place her on the Tacoma-San Francisco route next spring.

Steamer Columbia

Constructed by the Harlan & Hollingsworth Corporation for the Pacific Coast—Equipped to Burn Oil—General Description of Her Hull and Machinery—Now En Route to the Coast

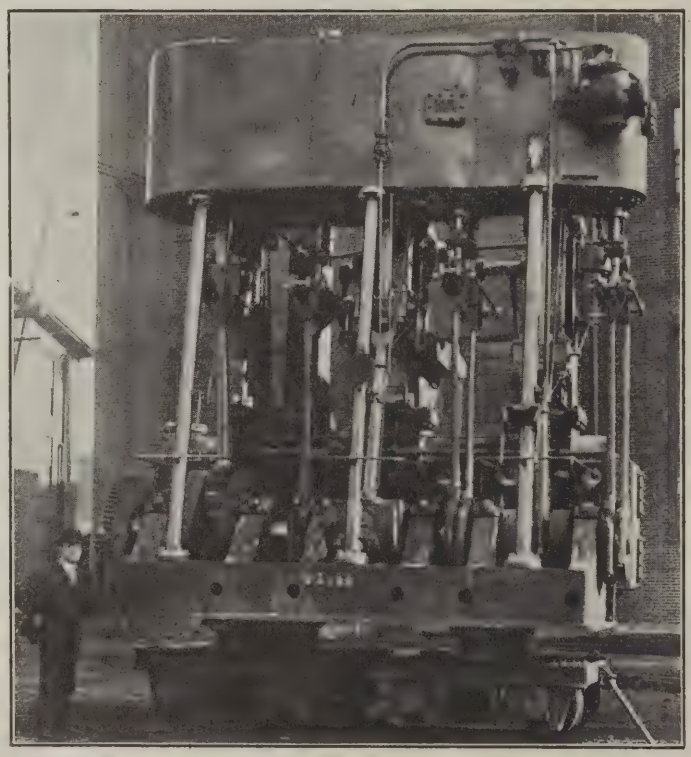
THE Harlan & Hollingsworth Corporation, Wilmington, Del., recently completed for Wilson Bros. & Co., San Francisco, the steamer Columbia, and she has now left for the Pacific coast. The dimensions of the Columbia are:

	Ft.	In.
Length over all	251	
Keel	243	3
Beam	41	
Depth to main deck	20	

The vessel is built of steel and is classed by the American Bureau of Shipping. The double bottom is on the cellular system with floors on every frame. The framing above tank is reinforced by web frames, beams are fitted to every frame, and main deck is completely covered with steel and pillared by H bars. The double bottom and forepeak are constructed for carrying oil fuel, fresh water being carried in tanks under engines and in after peak. The vessel is divided transversely by three watertight bulkheads. She has one hold, served by two large hatches, 28 ft. x 14 ft., on the main deck. The Columbia has a forecastle and long poop and is rigged as a two-masted schooner, the masts being of steel. Each mast carries two booms, each of which is capable of lifting 7 tons. The foremast carries a cross yard and square sail, also a leg-o'-mutton sail, and main mast is rigged with a storm sail. The mast and boom rigging is exceptionally heavy, all shrouds, stays and cargo running gear being steel wire and blocks of Boston & Lockport make in steel shells. Chain lashings with turnbuckles and slip hooks are provided so that the vessel may carry a deck load of lumber. Two powerful winches are fitted at each mast. They are of the vertical type manufactured by the Union Iron Works, San Francisco, Cal.

The vessel is fitted with a steam windlass. Steam warping capstan and steam steering engine are of Hyde make. The steering engine operates a pinion through a friction device which absorbs all shocks. The pinion meshes directly with a geared quadrant on rudder stock. The hand steering gear operates the quadrant in a similar manner. A powerful towing engine is located in a house on the poop deck. This machine is of the Shaw-Spiegle type, built by the American Engineering Co.

The crew are housed in the forecastle; the steerage and waiters are in the poop. The mess room, cold storage rooms and engineers' rooms are also in the poop. Passenger accommodation is in a house built on the poop deck at fore end of which is the dining saloon with pantry and galley abaft same, the latter having communication with bakery by stairway. All of the staterooms with the exception of two are outside rooms, having inside doors so that passengers may reach dining room without going outside. There are three berths in each room, and all the furniture is of oak. A sitting room is provided for passengers and a smoking room in plain oak, both being located on boat deck, access to which is obtained by inside stairway. The poop deck is sheathed with heavy pine and with boat deck forms a promenade for passengers. The officers' quarters are in deck house at fore end of boat deck and immediately abaft the pilothouse. These rooms are finished in oak. The captain's room is paneled in oak and has door opening to pilot house. The pilot house is fitted with a navigating bridge overhead, the bridge being carried out to the side of the ship.



TRIPLE-EXPANSION ENGINE OF THE STEAMER COLUMBIA, PHOTOGRAPHED JUST PRIOR TO INSTALLATION

The propelling machinery consists of one triple-expansion, surface condensing engine with cylinders 19, 30 and 50 in. diameter with a stroke of 36 in. The high pressure and intermediate pressure cylinders have piston valves, while the low pressure cylinder has a double-ported slide valve. The condenser is built in with the frame of the engine. The valve gear is of the Stevenson link type. A steam reversing gear is installed and water cir-

culation is provided for all bearings. The air pump and two bilge pumps are attached to back of condenser. Ths independent pumps, made by the Fairbanks-Morse Co., are the main and auxiliary feed, donkey and fire, bilge and deck, sanitary, salt water and fresh water pumps.

Steam is supplied from two single-ended Scotch boilers, 12 ft. diameter by 11 ft. 6 in. long, each boiler having three furnaces and allowed 180 lbs. pressure. A vertical donkey boiler, 4 ft. 6 in. diameter by 9 ft. high, is located on main deck. Settling tanks are built in boiler room in connection with fuel oil systems. One oil tank pump and two oil fuel pumps are installed. The system of supplying oil to furnaces for combustion and arrangements of burners require no steam or compressed air for atomizing the oil, and is known as the Dahl patent oil burning system, manufactured by the Union Iron Works, San Francisco. This system was described in the August MARINE REVIEW. The steamer is lighted throughout by electricity by two General Electric generators, one of 13 K. W. and one of 6.6 K. W. capacity being installed.

A 12-ton capacity evaporator is installed for making up fresh water losses and also a vertical multicoil feed water heater, both of Griscom-Spencer Co. make. A 1-ton refrigerating plant of Vulcan Iron Works make is installed for cooling provisions and supplying ice water. She is also fitted with a wireless telegraph apparatus.

The Columbia can carry 2,117 gross tons cargo, 4,228 barrels of fuel oil and 94 tons of fresh water on a draught of 18 ft. She has accommodations for 50 first-class and 15 steerage passengers, and carries a crew of 30. On her trial with ballast tanks forward the vessel made a mean speed of 11 knots and developed 1,200 I. H. P.

She left the Harlan & Hollingsworth yard in command of Capt. C. E. Allen with Chief Engineer P. Concannon in charge of the mechanical end.

Submarine Torpedo Boat Seal

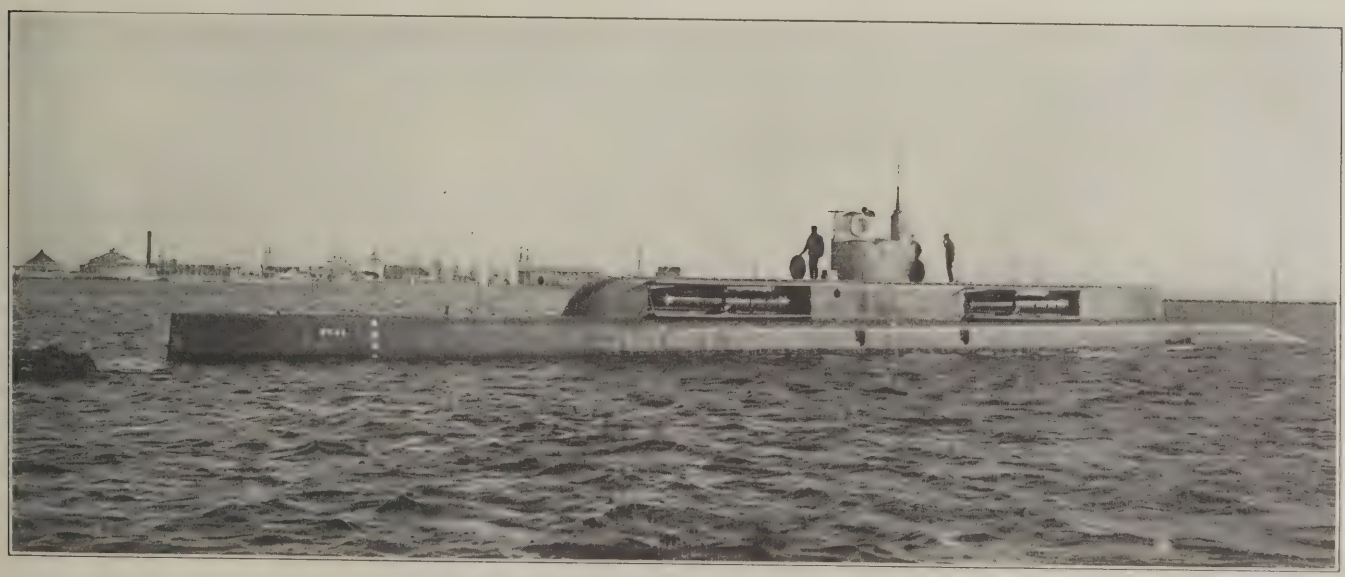
The First of the Lake Type to be Built for the United States Navy—Some Results of Her Trials

THE submarine torpedo boat Seal or G-1, as she is now known, built by the Lake Torpedo Boat Co., Bridgeport, Conn., recently completed her acceptance trials off Provincetown, Mass. Her trials consisted of numerous tests to prove her speed and endurance machinery, strength of hull to resist pressure, tests of firing torpedoes while submerged, ability of the crew to leave the vessel while submerged, means of communicating with the surface while submerged and ability to remain at rest while submerged.

The Seal was the first of her type to be built for the United States navy and under the terms of the contract, payment was to be withheld until she had satisfactorily concluded all tests.

The contract price was $450,000, but there were various penalties attached, such as $15,000 per knot for failure to make contract speed, $500 an hour for failure to carry a certain number of hours fuel supply at 14 knots speed, $500 a minute for failure to submerge in light condition while running at 14 knots to submerged running at 8 knots in more than 6 minutes' time; $100 a second penalty for failure to reverse from full speed ahead in less than 10 seconds while running at 14 knots; $1,000 an inch for failure to secure a metacentric height of 15 in. when submerged.

The function of the ordinary submarine is simply to fire torpedoes. They are carried in the bow tubes and the vessel must be steered towards the target. The Seal carries not only bow tubes, but also deck tubes in a superstructure. Side doors are opened in this superstructure and the torpedoes being located in revolving torpedo tubes, the torpedoes may be trained either to broadside, the same as any ship's gun, or as they are trained in a surface destroyer. The design permits of the discharge of torpedoes while the vessel is at



BROADSIDE VIEW OF TORPEDO BOAT SEAL

rest submerged. The Seal is also fitted with wheels for navigating on the bottom.

In her tests the Seal exceeded every contract requirement. Her contract surface speed was 14 knots; she made 14.7 knots. Her contract speed submerged was 9½ knots; she made nearly 11 knots, and at a speed of 5 knots she can run continuously submerged for over 125 miles. At a speed of 8 knots she can make a voyage of over 4,000 miles on the surface and over 2,500 miles semi-submerged.

The contract called for her to be able to discharge batteries while navigating under one engine; the trials showed that she could discharge batteries at the normal rate under one engine, and be navigated at the same time at a speed of over 10 knots with the other engine.

One of her trials was to proceed submerged at a speed of 9½ knots over the measured mile during which period the depths should be maintained at 3 ft. She was run submerged at early 11 knots, and the depth did not vary at 2 ft. and at 9½ knots the depth over the course was maintained within 1 ft.

Balancing submerged at rest she was held at a depth of approximately 65 ft. for 10 minutes, while with the use of her fore and aft anchors she can remain submerged at rest at any desirable depth up to 200 ft. for two or more days, if necessary. The contract called for her to be submerged to a depth of 200 ft. and to remain submerged at that depth for a period of 10 minutes. It is usual in such tests for submarines to be lowered by means of a derrick without any one in them, but in the case of the Seal, Capt. Sloan Danenhower took her down to a depth of 256 ft. with her own crew.

As a final test Capt. Danenhower also dove out of the door in the diving compartment to show how readily the crew could escape from the Seal if she should become disabled and unable to be brought to the surface.

After her tests she returned to Bridgeport for painting, preliminary to her delivery to the Brooklyn navy yard. Lieut. Kenneth Whiting will command her.

Deckloads of Lumber

Why the Attempt to Extend the British Act to Foreign Countries Should Be Resisted

By Arthur R. Liddell, Charlottenburg

THERE are certain indefensible laws on the statute book which linger on because of the hopelessness of the attempt to get them repealed or even discussed on their merits in parliament. One of these is the enactment relating to deckloads of timber in winter. Unfortunately, some well-meaning people, who are not experts, not only wish to retain this enactment, but actually press its adoption on other nations. The secretary of the Imperial Merchant Service Guild lately took this course, and a contemporary newspaper applauded him, and thought the time opportune for approaching foreign governments in the matter.

Now, naval architects who have given attention to the subject know that the law as it stands interferes in a most unwarrantable manner with business without adding to the safety of either vessel or crew. There is many a vessel in existence that would be the better of a higher deckload than that of 3 ft., and many another that ought not to be allowed to carry any deckload at all.

A vessel intended for the carriage of deckloads of timber is or ought to be specially proportioned for her work. A properly stacked load may be looked on as a partial addition to the height of the vessel. It increases her range of stability, and, provided it be properly secured, it improves the general conditions of safety and comfort in the same way as an additional deck erection would do. The GM-height with deckload is less than it would be in the absence of the latter, but it can also afford to be less, since a vessel with a large proportion of depth to breadth and a high freeboard is in her best sea trim with the least GM-height that is practically possible. Now the least admissible reserve of GM-height is that which might be lost by the burning out of bunker coal and consumption of stores and by the presence of water in the bilges, and this can be determined either by calculation in the drawing-office or by observation made in the course of a voyage or two at sea.

Suitable Seagoing Qualities.

Provided he be not interfered with by the owner, the captain has it in his power to give his vessel the most suitable sea qualities possible on every voyage. He must only know when to cease loading and not give way to the temptation to carry just a little more than he knows to be right.

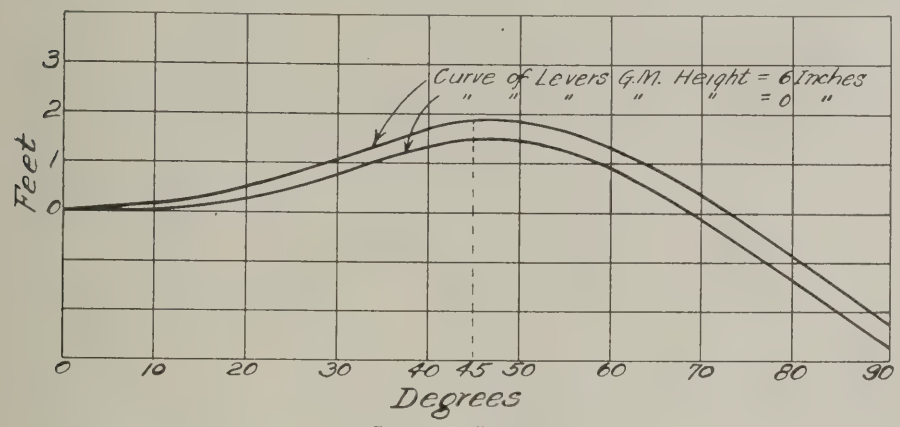
Under the present "police regulation," a vessel that has a large proportion of depth to breadth, and is, perhaps, not fit to carry a deckload at all, may be overloaded with impunity till the "3 ft. above deck" limit is reached, or she takes a decided list; indeed, the non-technical owner will often insist on his privilege. Moreover, the law does not even require that the 3 ft. deckload be distributed in the manner the most suitable for the stability of the vessel. Meanwhile, a vessel which has a small proportion of depth to breadth and a regulation freeboard, and would be an infinitely better sea-boat with an increase of length of erections or their equivalent or with a "heightening" of the erections—quarter-deck—that she already possesses, must not be stacked to a proper height because it "might" be to someone's advantage to overstack her.

From the point of view of stability, the greatest height of deckload that will bring the vessel to her destination without a list should be aimed at, and this may be more or less than 3 ft. The drawbacks to this are the difficulty of securing the cargo from shifting or breaking loose and the danger of the timber deckload becoming heavier by the absorption of moisture or by incrusation by ice. Now, in the countries in which high deckloads are allowed all the year round, means are found for securing the timber to such a degree that few accidents occur—not more, in fact, than with the average run of cargoes—that no one thinks of calling in question. The wetting and iceing-up of the timber are things for which naval architects and seamen have coefficients and rules obtained from experience,

and there is no more difficulty in applying them than there is in making the stowage arrangements of any other vessel.

Curve of Levers.

A timber-laden vessel may, for example, have a temporary proportion of depth to breadth equivalent to about seven-tenths and an unusually large free-board. If we assume a rectangular block 40 ft. in breadth by 28 ft. in depth, with a freeboard of 14 ft.—to top of deckload—and a draught of 14 ft., the surves of levers for GM-heights of 0 in. and 6 in., respectively, may be as shown in the illustration.



CURVE OF LEVERS

It will be seen that with a GM-height of 6 in. the vessel is almost uncapsizable, and that, assuming the GM-height reduced to 0, the average height of the lever curve is still very considerable and its range a very wide one. It may be objected that the timber stack has spaces between the planks and cannot therefore be regarded as a solid erection. This, however, would mean that the lever curve should be corrected so as to be rather lower at the small and rather higher at the large angles and to have a still wider range, and since the same initial stability would be aimed at in the stacking of the timber, the real conditions would be better than those taken from the block and shown in the illustration. The effect of ice incrustation of the timber is to lower the curve at the small angles and to raise or at least not to lower, it at the large ones.

The fact is, that the police interference ordained by the act is made at the wrong place. If it be desirable to relieve the captain of a vessel of responsibility at all, it is the efficiency of the lashings, and not the height of the deckload, that should be looked after. As the law now stands, a vessel suitable for the carriage of, say, a 10-ft. deckload and not for less than this, is condemned to go to sea in winter with one of not more than 3 ft. in height, which means either that she is undesirably stiff or that she has a small range of stability.

It should, perhaps, be mentioned that a vessel with a well-trimmed deckload of timber will occasionally have the tendency, shown by every vessel with high freeboard, to roll to large angles. When a vessel meets with waves of periods that synchronize with her own, she will roll to greater and greater angles till some change occurs in her resistance to rolling. This is supplied by the dipping of her deck edge into the water. The surface of deck thus immersed acts like a bilge keel intermittently applied, and gradually obtains greater power in damping the rolling motion till the angle of heel is, perhaps, one and a half times that at which the deck edge became immersed. It may, perhaps, be questioned whether the much-prized quality of high freeboard is an unmixed advantage for any vessel. In the case of the timber-laden vessel, however, it is seldom that the side of the deckload forms an unbroken wall, and it is probable that the uncovered deck spaces and the roughness of the exterior will damp the motion before unpleasantly large angles are reached. Besides, with the small initial stability provided, the rolling will develop very slowly, and, indeed, the critical synchronizing waves will be very long ones, such as the vessel will rarely meet with.

Rolling to Large Angles

In general, it may be asserted that, for the carriage of timber, vessels will be in their best and safest trim with the deckloads for which they have been designed, whether in winter or in summer, and a law that restricts and thus practically fixes a particular height for the stack is one that in the majority of cases makes, not for safety, but for danger. In some of the foreign shipping circles that are asked to repeat the British mistake, the responsibility of keeping a timber carrier upright is placed on the shoulders of her captain, and with good results. Since the captain is not always a free agent, it might be still better to extend the responsibility to any others who may interfere with him, whether they can plead ignorance of technical matters or not. After feeling his way for a voyage or two, he will certainly know what is good for his ship and her crew better than any policeman.

If restrictions are to be laid on a timber carrier at all, they should be applied to the design of the vessel herself. She might, perhaps, be forbidden to go to sea with an improper proportion of total depth to breadth, but, the design once passed, the deckload should not be arbitrarily interfered with in the manner now required by law. A deckload of heavy timber will naturally have to be lower than one of light timber, but this would regulate itself. If a regulation must be made, it should take the form that a vessel with a deckload of timber must not either go out of or come into port with a list due to want of initial stability.

New Machine Shop at Cramps

The Wm. Cramp & Sons Ship & Engine Building Co., Philadelphia, are adding a new machine shop to their plant. The new building is to be located at Richmond and Dyott streets adjoining the present machine shop, and will be 458 ft. long, 141 ft. 2 in. wide, 60 ft. high, consisting of three bays, the middle bay being 76 ft. 2 in. wide, and the side bays 40 ft. and 25 ft. wide respectively, with an outside storage yard 60 ft. wide. The building will be equipped with one 5-ton, one 10-ton, one 20-ton, three 30-ton, one 50-ton and one 75-ton cranes supplied by the Morgan Engineering Co. The equipment will be of the latest electrically-driven machinery, consisting of boring mills, lathes and other large machines. While the tool equipment has not been fully determined upon, two large boring mills were recently ordered from the Niles-Bement-Pond Co.

The liner now being built at Harland & Wolff's yard, Belfast, for the Holland-Amerika line, will be named Stadtenham. Her dimensions will be 740 ft. long, 86 ft. beam and 48 ft. deep. Her engines are twin-screw reciprocating with a center low pressure turbine.

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Ship Materials Free

The Panama canal act as passed by congress contained a provision admitting free of duty all materials intended for the construction, equipment or repair of vessels in American yards, the exact language being as follows:

That all materials of foreign production which may be necessary for the construction or repair of vessels building in the United States, and all such materials necessary for the building or repair of their machinery, and all articles necessary for their outfits and equipment, may be imported to the United States free of duty under such regulation as the secretary of the treasury may prescribe.

The secretary of the treasury is now prescribing these regulations and his interpretation of the paragraph will be looked forward to with interest. The point has been raised as to whether under the act a vessel could replenish its outfit, such as crockery, table linens, shapes, etc.

The importation free of duty of material to be used in the construction of vessels in the foreign trade (and in the coastwise trade for six months of the year) has been on the statutes for many years, but no particular advantage was ever taken of it. This restriction as to coastwise trade is now removed and vessels wholly constructed of foreign materials may engage in coastwise service all the year round.

Opinions differ as to the practical outcome of the provisions. As far as shapes and plates are concerned, it is not likely that any will be imported, as there is no material difference in the prices of plates in this country and abroad; but there may be some importation of auxiliaries such as pumps, chains, etc. At any rate, it is important legislation and the effect will be watched with interest.

The Panama Canal

And now it is our friends in Germany who are very much excited over the fact that congress has decided to let our coastwise vessels go through the Panama canal free. They are now declaring that the freedom from tolls granted to United States vessels will seriously injure German shipping. They don't seem to understand that German shipping was never any part of our coastwise trade, and that there is no intention of permitting any foreign ship ever to engage in it. It is purely a domestic problem, always has been, and always will be. American vessels engaged in foreign trade pay tolls the same as any other vessel. The chief advantage of the canal to the United States is the saving that it makes in distance to the west coast of North and South America and to certain points in the Orient.

The Germans have figured the saving in distance from Hamburg to various west coast ports through the Straits of Magellan and the Panama Canal as follows:

To	Magellan Straits	Panama Canal	Difference
Valparaiso	9,062	7,720	1,342
Iquique	9,823	7,112	2,711
Callao	10,303	6,449	3,854
Guyaquil	10,953	5,954	4,999
Panama	11,569	5,112	6,457
Acapulco	12,217	6,549	5,668
San Francisco	13,836	8,414	5,422
Puget Sound	14,550	9,132	5,418

It is estimated that about twelve days would be saved on the voyage from Hamburg to Iquique, twenty-two days to San Francisco and twenty-six to Panama, obviously a very great advantage to German shipping.

As the foreign trade of the United States is almost exclusively carried in foreign ships, they enjoy a great advantage in using the Panama canal when sailing from New York to various far eastern ports. A comparison of these distances via Suez works out very greatly to the advantage of the Panama route, as follows:

	Via Suez	Via Panama	Saving via Panama
Yokohama	13,189	9,709	3,480
Kobe	13,036	9,976	3,060
Nagasaki	12,670	10,259	2,411
Vladivostock	13,248	9,767	3,481
Shanghai	12,406	10,695	1,711
Amoy	11,864	10,966	898
Hong Kong	11,589	11,231	358
Manila	11,446	11,436	10

These economies of distance show the advantage of the canal to foreign vessels visiting our ports. Of course, they are of equal advantage to American vessels trading to those ports, but unfortunately our tonnage under the American flag in the foreign trade is very small, and cannot seriously compete with foreign shipping owing to higher intial cost and higher operating charges.

The present stream of traffic from Europe through the Suez canal to the west coast of the Pacific will undergo no change after the opening of the canal. It will be possible, for example, to reach all the ports in the far east and Australia from Hamburg more quickly by way of the Suez canal than through the Panama

canal. The distances from Hamburg by the two routes are as follows:

Hamburg to—	Via Suez	Via Panama
Singapore	8,395	15,168
Hong Kong	8,032	14,638
Yokohama	11,544	13,163
Melbourne	11,378	13,299
Sydney	11,833	12,036
Auckland	12,958	11,516

As against this the United States gains considerable in distance. Japan, for example, is brought about 3,000 sea miles nearer to New York than it is at present by way of the Suez canal. In fact, all of the ports as far as Hong Kong will be reached sooner by Panama than through Suez. Hitherto the voyage of an ordinary cargo steamer from Hamburg to all parts of East Asia has been from six to seven days shorter than that from New York. The Panama canal will cause this handicap to disappear. The relative distances to the far east from Hamburg via Suez and from New York through Panama are as follows:

To—	From Hamburg via Suez	From New York via Panama
Yokohama	11,614	9,709
Kobe	11,461	9,976
Nagasaki	11,095	10,259
Vladivostock	11,673	9,767
Shanghai	10,831	10,659
Amoy	10,298	10,966
Hong Kong	10,014	11,231
Manila	9,871	11,436

According to this table all ports north of Amoy, especially Japan, will be brought much nearer to New York, but south of that line (and therefore including the Philippines) Hamburg has the advantage. There will also be a similar saving in the distance from New York to Australian ports via the Panama canal as shown below:

To—	From Hamburg via Suez	From New York via Cape	From New York via Panama
Freemantle	9,821	11,508	11,278
Adelaide	10,990	12,128	10,361
Melbourne	11,318	12,206	9,935
Sydney	11,774	12,281	9,584
Newcastle	11,850	12,462	9,754
Brisbane	12,256	12,720	9,806

The Panama canal also brings New Zealand some 2,600 miles nearer New York. The tentative date for the opening of the canal is October, 1913.

Lake Trade

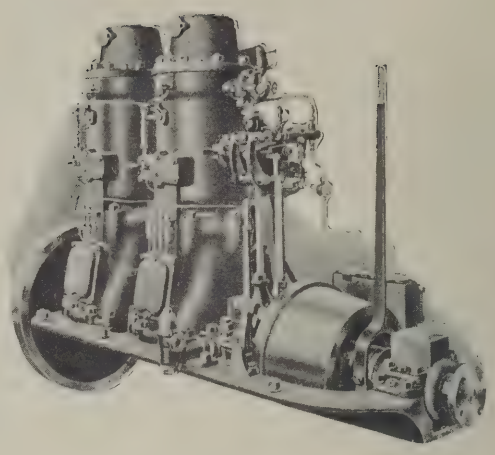
A most curious phenomenon exists today in lake trade and one that is almost beyond belief. There are not ships enough on the lakes to do the business offering. This is a most singular condition when it is considered that even as late as two years ago hundreds of ships were knocking about the harbors unable to get cargoes. Of course, the present condition has been brought about in a fair degree by the elements. Navigation has been attended by numerous elemental difficulties during the past three months, notably a succession of dense fogs which have greatly delayed the fleet in the rivers, but on the other hand it must be borne in mind that the bulk of the trade has depended upon ore. There has at no time during the year been a normal movement of coal and rains in the northwest have greatly interfered with the movement of grain, but notwithstanding these depressing features all the ships have been employed, and in fact some of the older wooden craft that have been lying in ordinary for years have been fitted up and put into commission. Had the coal trade been at all normal, an actual shortage of vessel tonnage would have occurred.

The extreme activity on the lakes is only a reflection of the wonderful revival which has taken place in industrial conditions generally throughout the United States. The iron and steel trade was never more active than it is now. It is unfortunate, of course, that notwithstanding the great transportation movement now being experienced on the lakes, the vessels are making very little money. The freight rate on ore, which, of course, is the dominant trade on the lakes, was reduced to such a point in the early spring that only the largest class of carrier could make a fair profit at the business. In fact, the only vessels that are now making a fair return at the existing rates are those which are controlled by the iron mining and ore consuming companies which can give them ample employment and good dispatch at loading and unloading ports. Of course, when the freight rate was cut no one could at that time see the tremendous impetus that the iron trade was to undergo, but it is an impetus which cannot well be stopped, at least within a twelfth month, and therefore an advance in carrying charges may confidently be expected next season.

It is no more than just that the vessel owner should receive a fair return upon his investment. In fact, he is entitled to a good; round dividend, as his business is at the best precarious. Until lately, very little money has been made in the three great divisions of the iron trade, that is to say, the mining of ore, the transportation of it on the lakes, and the smelting of it into pig iron. When the severe cut in the price of ore was made last spring, many mines were faced with the alternative of doing business at an actual loss or suspending operations altogether. A number of mines that are ordinarily good propositions cannot break even at present prices, and one has only to take the figures of actual costs of materials at the furnaces to realize that until lately none of the merchant pig iron furnaces have been making any money at all during the past three years. The iron business has been conducted altogether on too close a margin of profit, and there can be no real and widespread prosperity in this country until its premier business is placed upon a money-making basis.

Of course, the tendency of prices during the past few months has been upwards and deservedly so, and it is practically a foregone conclusion that the business of 1913 will be transacted upon a higher basis yet. It looks now as though sales of ore for 1913 delivery will be pretty generally concluded before January is over. Merchant furnaces have by no means abundant stocks on hand, and the drain upon the reserve on Lake Erie docks during the winter months will be very heavy.

The Semi-Diesel Heavy Oil Engine



How It Has Been Developed By European Engineers and Put Into Practical Use as Propulsive Power for Yachts and Working Boats. Its Low First Cost Gives it an Advantage Over High Compression Types

By J. Rendell Wilson

THE recent development of the marine Diesel engine has also brought into prominence in Great Britain a class of low-compression heavy oil motor, which, to appease the popular fancy, has now been given the term semi-Diesel. As the editor of *Power Boating* remarked not long ago to me "the name Diesel seems to cover a multitude of sins." Hence a machine which should rightly be termed a low-compression heavy oil engine shall until further notice, according to the unwritten law; be known as the semi-Diesel, and the manufacturer who dares to call a spade a spade is likened unto the unwise that rush where angels fear to tread. For many years this class of engine has been constructed on the continent of Europe, especially in Sweden, where it has been regarded as a heavy-duty commercial motor, and thousands have been installed in fishing craft and barges.

THE MARQUIS OF GRAHAM'S YACHT MAIRI FITTED WITH 130-H. P. BEARDMORE SEMI-DIESEL ENGINE

Among the better known types may be mentioned the Bolinders, Skandia, Dux (ex Primus), Swiderski, Avance, Alpha, Kromhout and Dan. Since the demand sprang up, English manufacturers have placed designs on the market including the Beardmore, Nat and Coates, while the above makes all have agencies. The Kromhout is now built in England, as well as in Amsterdam. The sale of this type of engine has been enhanced by reason of the present high cost of gasoline fuel, it being 72 cents and upwards per two-gallon can in the British Isles.

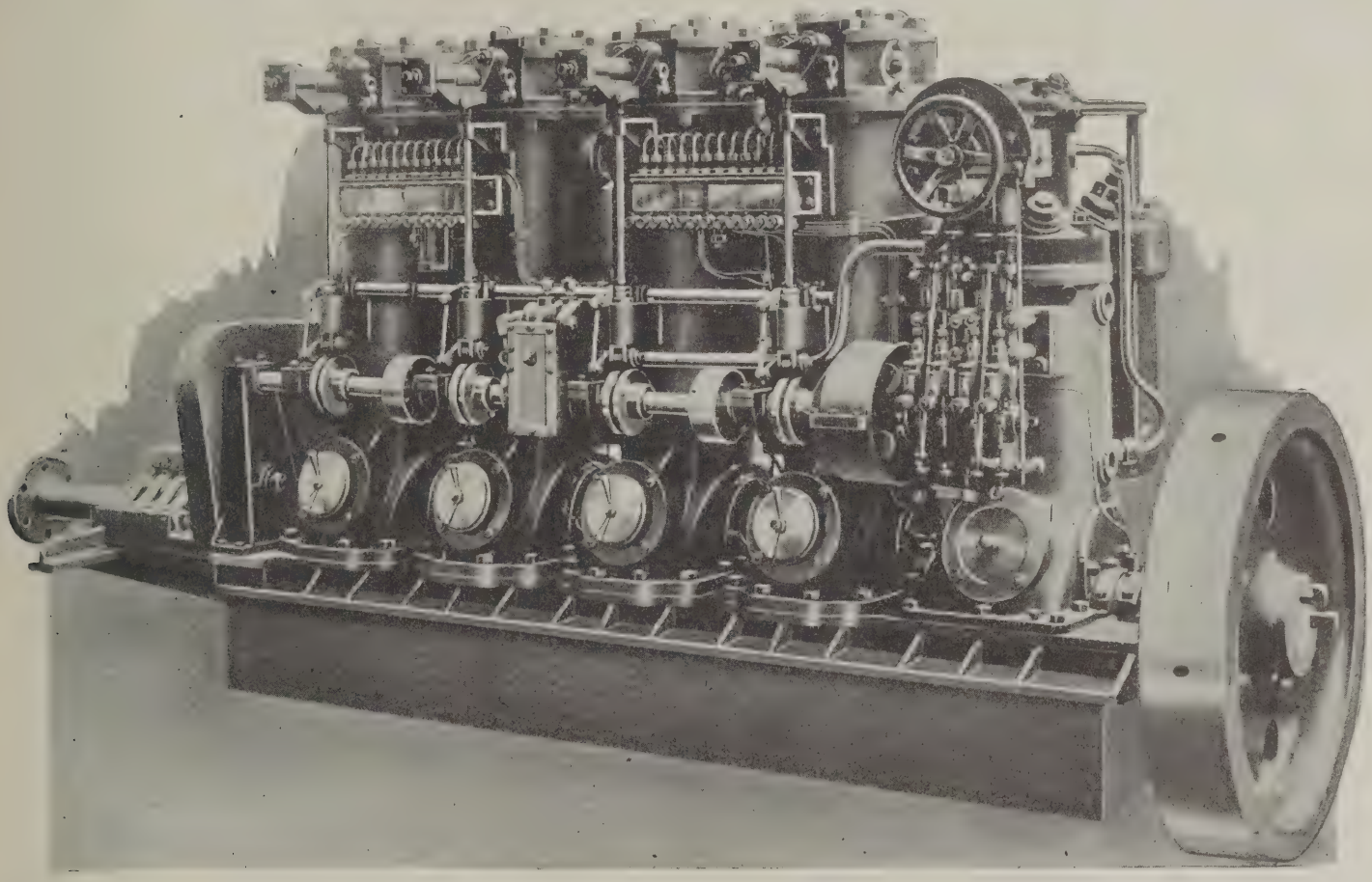
Now let us turn to the advantages of the semi-Diesel engine. As yet they are all of the two-stroke class, and, as they require none of the intricate and expensive compressors, etc., required by the true Diesel motor, they can be built quite cheaply. No magneto, coil or any electrical ignition whatever is required, so here again is a saving in construction and upkeep. As regards price the single-cylinder 12 B. H. P. Nat engine and reverse gear lists at $375, while the two-cylinder 40 B. H. P. engine with reverse gear costs $1,300, which are lower than the average British marine gasoline equipment. Another advantage is that being slow running a big and efficient propeller can be adopted.

Let me explain briefly how the semi-Diesel engine operates. Over the combustion chamber a small iron box, known as a hot-bulb or hot-pot is mounted on the cylinder head. For starting purposes this is heated by a blow lamp. Between the bulb and the combustion chamber there is a small orifice forming a through connection. On the up-stroke of the piston the atmospheric air is compressed in the combustion chamber, and hot-bulb, to a pressure generally about 200 lbs. per square inch—sometimes less—and just before the top of the stroke, fuel is injected in a spray by a small plunger pump into the hot-bulb and is automatically fired by the heat. Once the engine has got well running the blow lamp can be extinguished as the heat of the explosions maintains the bulb at a red heat provided the engine is not kept running very slowly for too long a period. On the down stroke of the piston air for scavenging is compressed in the crankcase and admitted or by-passed to the cylinder through ports in the usual manner. It will be seen that the difference from the Diesel lies in the fact that ignition or combustion, is not by heat generated by high compression, the latter needing very delicate machining, as well as accessories such as fuel injection, air blast fittings, including special valves, compressors, and reservoir tanks.

Has no Equal for Economy

In sizes ranging from six to 150 B. H. P. the semi-Diesel has no equal for economy in running, as either gasoline, kerosene, or cheap residue oils can be used, and its first cost is not high, also its size and weight are far from excessive. In the

British Isles large numbers are in use in lighters, coasting vessels, fishing-boats, barges, and ferry-boats, while a few have been installed in cabin-cruisers and yachts; but of the latter class large numbers will have this type of engines fitted during the coming winter. As soon as American marine engineers and cruiser owners realize the advantages of the semi-Diesel engine, and the safety gained by its adoption, there is no doubt that there will be a big demand. The manufacturer who first recognizes this and pushes it in a practical manner will reap his reward. Already the Viper Co., of Nova Scotia, has taken up this type of motor—the Nat, I understand,—and hopes to do great things with it in their district.



FOUR-CYLINDER, 130-H. P. BEARDMORE HEAVY OIL ENGINE INSTALLED ON MOTOR YACHT MAIRI

Power Plant of Papakura, a Scottish Yacht

Among the Swedish engines the Bolinders is noteworthy. It is manufactured by the Bolinders Co., of Stockholm, and amongst the pleasure craft recently fitted with one of these motors is Walter Brock, a Scottish powerboat man's new motor yacht Papakura, built for him by McLaren Bros., of Dumbarton, N. B., for service on Clyde waters. She is 60 ft. long by 11 ft. 6 in. beam, with 6 ft. molded depth and is of steel and wood composite construction. Her frames, beams and reverse frames are of 1¾ in. by 1¾ in. by 3/16 in. galvanized steel, while her planking is of 1½ in. teak, and her deck of 1½ in. yellow pine.

But it is in the engine room that our interest is centered. The installation was carried out by Messrs. Douglas, Primrose & Co., of Glasgow. The propulsive machinery consists of a two-stroke type direct reversible four-cylinder Bolinders heavy oil engine of 80 B. H. P. The cylinder bore is 9 7/16 in. by 9 27/32 in. stroke, and the power is developed at 425 revolutions per minute. The weight of this engine complete with stern gear is four tons and the guaranteed maximum fuel consumption is 6.4 gallons per hour at full speed. Air pressure for starting is obtained from a reservoir which is connected to the cylinders, and is charged up from the explosive pressure in the cylinders while the engine is running.

Constructional Details of Papakura's Engine

The constructional details of the engine are of special interest, as the arrangements are very complete. The cylinders with their fuel pumps are controlled in pairs, and so I will describe the mechanism of the after pair, the mechanism of the forward two being exactly the same. Mounted on the after cylinder are two crescent-shaped arms, or rockers, for operating the plunger-type fuel pumps These rocker-arms are actuated by eccentrics on an extension of the crankshaft. The upper end of each rocker-arm works a striker, which is mounted on a swinging fulcrum and slides on a stepped surface. Each striker, as it moves backwards and forwards, works its fuel pump and just before a piston reaches the top of the stroke a charge is injected, the cylinder air-pressure then being about 110 lbs. per sq. in.

To vary the amount of fuel injected, and consequently the speed of the engine, the positions of the rocker-arms are altered by means of a small hand lever, thus shortening the stroke of the pumps. The latter are very small, being about ⅜ in. bore by ⅛ in. stroke, varying, of course, according to the size of the engine. Governing is automatic and quite simple. Should the engine speed be excessive, each striker jumps on the stepped surface on which it slides, causing its striking blade to miss the striking blade of its fuel pump. Consequently no fuel can be injected until the engine is again

turning at normal revolutions. The combustion chambers are, by the way, fed with a continuous water drip, which gives extra power and aids to cool the engine.

Reversing the Bolinders Engine

Reversing of the engine is direct, but a clutch is necessary. The lower end of each rocker-arm operates an auxiliary fuel-pump, which only comes into action when it is required to reverse the engine. On the engine-shaft there is a loose sleeve to which is connected one end of a rod, the other end being secured to the rocker-arms. On jambing the sleeve, by means of a lever, against the engine-shaft, the friction slightly lifts the rod and, of course, the rocker-arms, thus throwing the main fuel pumps out of action and bringing the auxiliary pumps into operation. As no fuel is being injected the engine slows down. The reason that no fuel is being injected is because the speed of the engine causes the governing apparatus of the auxiliary pumps to be in force. However, as soon as the engine slows down, a charge of fuel from one of the auxiliary pumps is injected on the up-stroke of the piston, causing a back-fire and sending the piston back again, incidentally the crankshaft continues turning in the reversed direction, as the main fuel pumps instantly resume their duties. Reversing occupies under 10 seconds.

The cranks are set in pairs, numbers one and three being together, and at 80 degrees to numbers two and four, the cylinders whose cranks are together firing simultaneously. Among other Bolinders-engined motor yachts may be mentioned Bamba VI, owned by Dr. McMahon, of Cork, and the Scottish cabin cruiser Etive. The Bolinders engine was introduced into England by Messrs. J. Pollock, Sons & Co., of London.

In the Nat engine we have one of the very few British-built and designed machines of this type. It is constructed by the Torbinia Engineering Co., of London, and it is this engine the Viper Co. has taken up. A two-cylinder 16-H. P. plant is installed in the cabin cruiser Alert. As the engine has not been on the market two years, not many yachts have been fitted by the makers, but a number of business boats have.

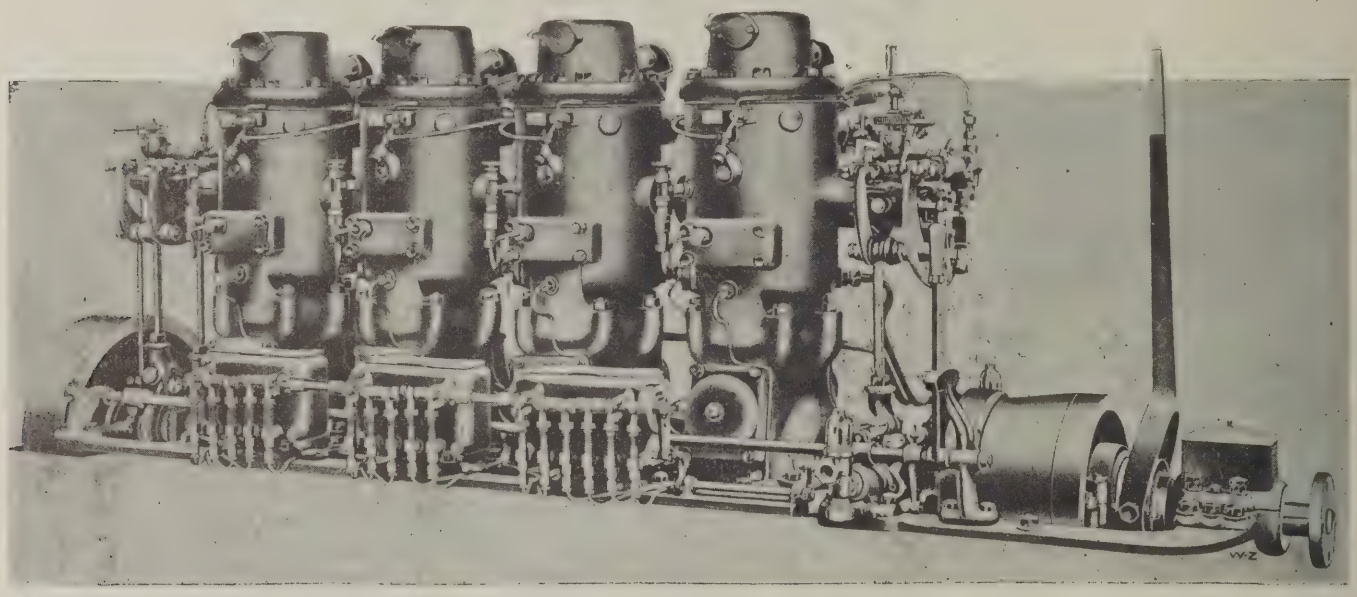
It differs in several ways from the Bolinders; and the principal features are that all the fuel pumps are operated by one rocking-lever mounted on the after cylinder, and the control is pneumatic, the speed of the engine being regulated by a small wheel valve. There are no ordinary valves, cams, gears, half-time shafts, water spray, or carburetor. Fuel having a specific gravity as high as 0.950 may be used, but the manufacturers recommend the use of Texas or Russian fuel oil, and gas oil (gasoleum). The engine of Alert has two cylinders 6½ in. bore by 6½ in. stroke, and develops its rated power at about 400 R. P. M., but working can be maintained at 160 R. P. M. It is of the three-port, two-cycle class with hot-bulb ignition, while the fuel consumption is about 0.7 pint per B. H. P. per hour. Cylinder compression is between 150 and 200 lbs. per sq. in.

The Small Power Nat Engine

The main rocking-lever is driven off one end by a vertical shaft from an eccentric on the engine shaft, the other end of the rocking-lever working the plunger-type water circulation pump. A bell-crank extension on the upper part of the rocking lever actuates the fuel pump by means of strikers on the hit and miss principle. Connected to the striker of each fuel pump is a small vertical rod, on the lower end of which is a piston with about ⅜ in. stroke, by 2 in. bore, working in a little dash-pot (air compressor). The up and down movement of this rod causes the striker to miss or hit the plunger of the fuel pump as desired. How this is done is best described as follows:

Action of the Nat Engine

The down stroke of the piston takes place under the action of a spring, the only outlet for the compressed air being at the bottom of the dashpot through a small wheel valve, and the latter can be carried to rear by the helmsman's hand by means of a pipe, or flexible tubing. Thus the down stroke of the piston, and the angular swing of the striker, are controlled by the wheel valve. By setting the latter for a certain engine speed, the duration of the exhaust period, and consequently the rate of travel of the small rod, coincides with the movement of the rocking-arm and the fuel pump is actuated by the striker. But should there be an increase in the engine speed, the synchronism between the two motions is upset, causing the striker to be temporarily deflected from its proper position, and it fails to operate the fuel pump, until the running speed is sufficiently reduced. From a description this would seem somewhat complicated, but in



80 H. P. BOLINDERS SEMI-DIESEL ENGINE ON THE POWER YACHT PAPAKURA

reality the mechanism is very simple. The ease of control, merely by turning a wheel valve, is quite apparent.

The Beardmore—a True Semi-Diesel Type

Another British-built and designed low compression heavy-oil engine is the Beardmore; but in this case refinement of detail has been carried to a greater extent than has the Nat, the fuel being injected by air blast, consequently it is a more expensive machine. The term semi-Diesel applies better, perhaps, to the Beardmore than to any other make. The makers are Messrs. Beardmore Bros., of Dalmuir, and the marine oil engine department is but a small section of this great firm of naval constructors. Apart from commercial craft, probably the most notable vessel with a Beardmore oil engine, is the Marquis of Graham's 65-ton raised-deck motor-yacht Mairi. This boat was completed towards the end of last year, having been built of steel to Lloyds 100 A-1 yacht class by Ritchie, Graham & Mylne. She is 85 ft. 3 in. long over all by 78 ft. low water line, with 13 ft. 6 in. beam, 8 ft. molded depth and 6 ft. draught. For auxiliary sail purposes, she is rigged as a two-masted schooner, and there is rather a tall funnel just abaft amidships, over the engine room, to which the exhaust outlet is carried.

Beardmore Engine in Mairi

Her Beardmore engine is of the two-cycle direct reversible type with four cylinders 9 in. bore by 12 in. stroke, and 130 B. H. P. is developed at 350 R. P. M., giving Mairi a speed of over 10 knots—11 knots was attained on trials. At the forward end of the engine is a two-stage air compressor and an inter-cooler, which are driven by an extra crank. The compressor is used for charging storage bottles for fuel-injection, starting, reversing, and the siren. The cranks of the engine cylinders are 90 degrees to each other, the compressor crank being set to compensate the unbalanced force. Crank-case compression is employed, the sub-divisions carrying the main bearings, and the air-scavenging and exhaust ports are uncovered by the pistons in the usual manner. The fuel generally used has a specific gravity of 0.9 to 0.93, and a blow lamp is necessary for starting. Fuel is injected against a hot baffle in the hot-bulbs at 400 lbs. per sq. in. To each cylinder there is a separate fuel pump, but the pumps are coupled and driven in pairs.

Starting, stopping and reversing are done by a single control wheel, and the three operations can be carried out in about four seconds. The wheel in question controls a rotary air distributing valve and also automatically adjusts the fuel injection valves. The distribution valve consists of a rotating disc with a single port in it, which registers, in turn, with four small ports connected by piping to the cylinders. Lubrication is by force feed from a battery of sight-feed pumps, a connection being carried to each working part. The water circulating and bilge pumps are driven off the after end of the engine, as is also a little auxiliary air compressor. The engine room auxiliary machinery consists of a 7 H. P. Reavell gasoline engine, which drives a stand-by two-stage air compressor, a powerful centrifugal pump, and a dynamo for lighting the ship throughout. Sufficient fuel for a voyage of 700 sea-miles at full speed, is carried in two tanks arranged at the fore end of the engine room.

Now that the construction of the true Diesel engine has been taken up in America, there seems to be no lack of orders, in fact I understand that manufacturers like the New London Ship & Engine Co. of Groton, Conn., have difficulty in keeping apace with orders. Now the semi-Diesel type is much easier to construct, and in the United States its price should be within reach of all. By reason of the heavy oils that can be used, danger from fire, where large quantities of fuel oil are carried is greatly reduced.

At the present time gasoline power for a pleasure yacht or work boat is limited to about 600 B. H. P.; but there is no obvious reason why such a vessel should not be fitted with, say, three 350-H. P. semi-Diesel engines. In fact, a 350-B. H. P. Bolinders is now being installed in a Scottish auxiliary ship. The saving in fuel costs over steam or gasoline machinery must be enormous with such a vessel, residue oil being so cheap in America. Personally, the writer considers that this class of engine must eventually be adopted quite generally by American marine engineers.

Emergency Lighting Sets

The lessons of the Titanic disaster are being quickly turned to good account, and one outcome is the equipment of ships with auxiliary engines for electric generating purposes.

Very satisfactory reports have been made of the Mirrless-Diesel emergency sets which have been installed on the White Star liner Megantic. The engine is a 45 B. H. P. Mirrless-Diesel oil engine, direct coupled to an electric generator. It works at 450 revolutions per minute, and is of the enclosed type with forced lubrication. The combined set is fixed on the upper deck, and a separate circuit is taken round the ship from the dynamos. This circuit provides sufficient lights in the passages, companionways, and near the lifeboats, to enable passengers to move about freely and the boats to be launched, even though the steam-driven dynamos in the main engine room are put out of action. The circuit is also connected to the wireless apparatus. In the event of an accident to the vessel, sufficient lights and the wireless telegraph apparatus could be kept going until the hull is completely submerged. The importance of this, as an aid to the launching of the boats without confusion or panic, and as a means of calling for help up to practically the moment of sinking, will be readily seen.

The installation of such a self-contained unit, carrying its fuel supply in close proximity to the engine, is to be preferred to a steam-driven dynamo, even if the latter were placed in the same position on the vessel, as to avoid the storage of coal and consequent dust on the upper deck, the steam for the engine would probably be drawn from the boilers in the main boiler room, which, owing to their situation below the water line, are liable, in the event of an accident, to be put out of action by the flooding or other damage to the boiler room. The "Mirrless-Diesel" works on crude or residual petroleum, the flash point of which is 230 degrees Fahr., consequently, there is no risk of fire, as would be the case if paraffine or petrol engines were installed for this purpose. The board of trade, furthermore, prohibits the carrying of paraffine or petrol. The installation of such a plant would remove the necessity for any engineer or fireman remaining below after the propelling machinery is shut down.

On board the Megantic the engine is set to work as darkness approaches, and is run until daylight, thus insuring the continuance of sufficient lights and the Marconi apparatus in the event of an accident to the vessel or steam plant. The engine is also run continuously during foggy weather.

These engines have been supplied to the British admiralty, the commonwealth of Australia, and the Japanese government, and are manufactured by Mirrless, Bickerton & Day, Ltd., of Stockport, Eng., who have at present in hand a large number of orders for emergency electric generating sets for ships now building.

Electrically-Driven Ship

The Montreal Transportation Co. is Building Abroad a Vessel for the St. Lawrence River to be Equipped With Diesel Engines and Electric Drive

THE Montreal Transportation Co., Montreal, has purchased from Swan, Hunter & Wigham Richardson, Newcastle-on-Tyne, a vessel of Canadian canal size, which is to be equipped with Diesel engines and electric drive. She will be the first merchant ship to be so driven. The vessel is of the following dimensions:

Length over all, 256 ft.
Length between perpendiculars, 250 ft.
Extreme breadth, 42 ft. 6 in.
Depth molded, 19 ft.
Forecastle, 48 ft.
Poop, 42 ft.
Speed, 9 knots.

It is estimated that the vessel will carry 250 tons more than a similar vessel with ordinary reciprocating engines. She is designed to carry 2,400 tons deadweight of cargo, fuel, fresh water and stores, on 14 ft. mean draught in fresh water.

Two steam boilers are provided for working the deck equipment, steering gear and electric light, and for the supply of heat for the living quarters. It may at first seem out of place to return to steam equipment for these uses, but the conditions of the service in question are such as to call for an auxiliary equipment at small capital cost. The season is short and the amount of work called for from the auxiliary equipment is small, and therefore although an electric equipment would be much more economic in working, there is no opportunity for the more economic plant to justify the increased capital expenditure, which is very considerable. The necessity for providing steam for heat has also a strong bearing upon the case. If the steam boiler has to be used it involves but little additional expense to provide steam for the steering gear, electric light and whistle. The boilers are oil-fired and the fuel and working pressure are in perfect control. The same fuel is used in the boilers as in the internal combustion engines. The main machinery equipment is, as shown in the drawings, in two units, each consisting of an engine, dynamo, and a winding on the propeller motor.

Description of Engine

The engine works on the Diesel four-cycle principle and has the following main dimensions: Cylinders, 12 in. diameter; stroke, 13½ in.; r. p. m., 400. There are six cylinders and the cranks are so arranged that the firing takes place at equal intervals.

The working parts of the engine are entirely inclosed and a system of forced lubrication is used, supplied by a valveless pump driven by an eccentric on the crank shaft placed at the compressor end. The second motion shaft is driven by means of a worm wheel mounted on the crank shaft directly midway between the center cylinder through a vertical shaft, which also carries the governor at its upper end. On the second motion shaft, which is placed at the front of the engine and carries the cams for operating the valves, are mounted the eccentrics which drive the two fuel pumps, there being a separate pump for each cylinder. This arrangement enables the power to be very equally divided between the cylinders. The compressor is driven directly from the main crank shaft and is mounted in the bed plate which is extended to carry it.

Electric Equipment

The starting of the engine is effected in the usual Diesel manner, by means of compressed air stored in receivers placed in a handy position near the engine. The compressed air for this purpose is supplied by the compressor on the engine, which also supplies that required for blowing the fuel oil into the cylinders. The engine is provided with a patent device for preventing the accumulation of fuel oil in the fuel valves, which are inoperative during starting. A small flywheel is fitted of sufficient weight to insure steady running and to facilitate barring round when required. It is bolted to a flanged coupling forged solid with the crankshaft.

Cooling water is circulated through the cylinder and compressor jackets by a pump of the rotary type which draws directly from the sea. This pump is driven by miter gearing from the compressor end of the crankshaft. The exhaust pipes are water-cooled.

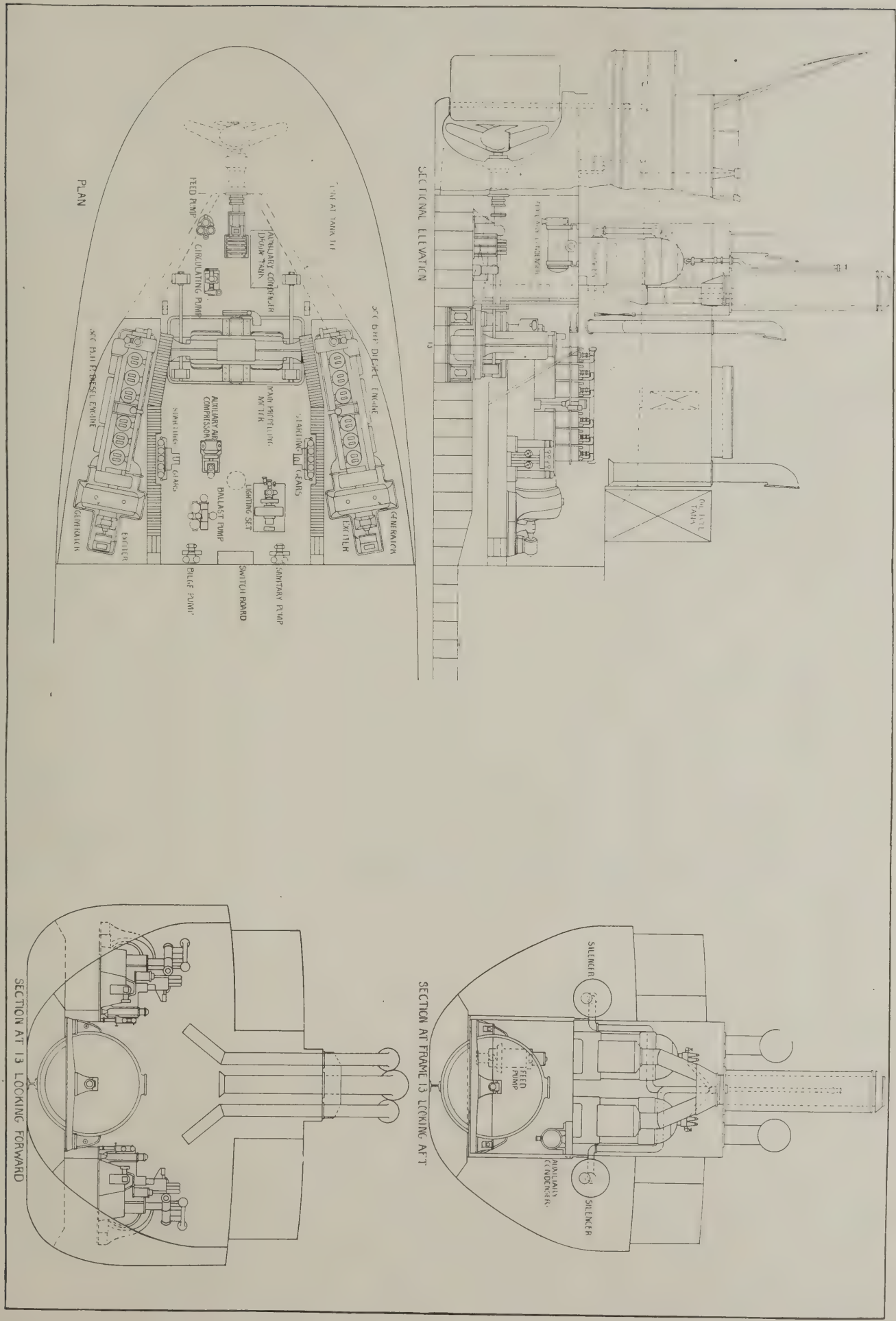
The air for the main cylinders is drawn through the bed plate, thus effectually silencing the suction.

In the normal operation of the ship the engines run under governor control at 400 r. p. m., but the speed of revolution can be adjusted by manipulating the governor so the engine may maintain constant revolution per minute at a rate considerably below 400, should this be required.

The electric equipment consists of two three-phase generators, each giving about 235 kilovolt-amperes at 500 volts alternating. The generators have six and eight poles, respectively, giving frequencies of 20 and 26.6 per second. Connected to the shaft of each generator is an excitor which in normal working gives about 30 amperes at 100 volts, but is capable of a considerable overload. A single three-phase motor is coupled direct to the propeller shaft. This motor develops 500 shaft h. p. The rotor is of the simple squirrel cage type without any electrical or mechanical connections other than its rigid attachment to the propeller shaft. The stationary part of the motor has two separate windings for 30 and 40 poles, respectively. The windings are mutually non-inductive, so that except for slight leakage of magnetism, they exercise no influence whatever on one another and operate independently on the magnetic circuit of the motor. When these two windings are connected respectively to the appropriate generator, the synchronous speed due to each is 80 r. p. m. when at full speed, or actually about 78 r. p. m. when at full speed. By changing the connections the direction of rotation is reversed and by connecting the 40-pole winding of the motor to the 6-pole generator, the synchronous speed drops to 60 r. p. m., or actually to 58 r. p. m., giving about three-fourths of the full speed of the ship under this condition. One generator may be stopped and the other left running at full revolutions under governor control, and therefore at approximately its full economy, because the power required to drive the ship at three-quarter speed is about half of that required to drive it at full speed. If either of the generators is left attached to its own winding, the other generator being shut down either by intent or by accident, the ship is propelled by either engine at a little over half speed, the speed of the ship falling with the speed of rotation of the engine until an automatic adjustment of power and speed is reached. This occurs at about half speed.

Control Gear

The control gear is so simple as to hardly require any specific description. In the first instance, it is not proposed to operate the control from the bridge, but arrangements are made by which this can easily be done, if required. There are five positions on the switch



ARRANGEMENT OF MACHINERY OF THE DIESEL-ENGINED SHIP WITH ELECTRIC DRIVE FOR THE MONTREAL TRANSPORTATION CO.

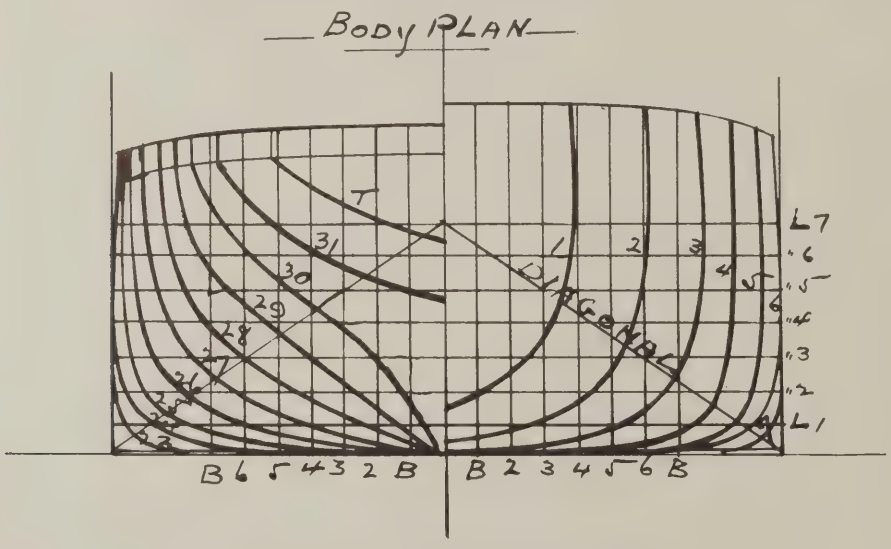
corresponding to the ordinary positions on the engine room telegraph. They are "full speed ahead", "half speed ahead", "stop", "half speed astern" and "full speed astern". Each position of the controller is definitely fixed by means of cams and roller so that stopping at intermediate positions is prevented. For half speed, No. 1 generator is coupled to No. 2 winding of the motor, and No. 2 generator is running light or stopped. For full speed each generator is connected to its own winding in the motor respectively. The controlling gear provides for the interruption of the excitation of the generators while the switch is being moved from one step to another. This mode of operation renders the electric circuits dead while the switching-over operation is being accomplished, and thus injurious sparking is avoided.

Isherwood System of Construction

In Which the Sheer, Half Breadth and Body Plans Are Discussed—When the Ship is Considered Fair

By Robert Curr

ROBERT CURR began in the September issue a series of articles descriptive of an Isherwood type steamer, 203 ft. long, 40 ft. beam and 18 ft. deep. It is Mr. Curr's intention to discuss every problem involved in the construction of the ship. Not a section will be overlooked and reasons will be given for the location of everything in the ship. These series should prove very helpful to students, draftsmen and ship designers generally.



PLAN 2—THE SKELETON OF THE SHIP

LINES.

PLAN 2. Shows the lines of this vessel which might be termed the skeleton of the ship.

The lines require three plans for reference: The SHEER, HALF BREADTH and BODY PLANS.

SHEER PLAN LINES: Base, sheer line at center, sheer line at side, knuckle line, level lines, stations, bow and buttock lines, diagonal line and endings.

HALF BREADTH PLAN LINES: Base, buttock and bow lines, deck line and diagonal.

BODY PLAN LINES: Base, rise of floor, level lines, molded width, diagonal and stations.

SHEER PLAN: This longitudinal elevation of the portside of the vessel with stem and stern post removed can be proceeded with as soon as the dimensions of the vessel are determined.

The keel forms the base, and lines run in parellel to same, are the level lines, and spaced 24 in. apart.

STATIONS: Are perpendicular and spaced 3.366 ft. apart. These stations are numbered from 1 to 31.

The stem shape is a matter of taste. Some prefer the straight stem; others the flare or inclined aft.

The run under the stern is governed by the diameter of the propeller; it being necessary to leave a clearance of a few inches between the shoe and the hull.

The height of the deck at the extreme after end is 20 ft. and the fore end 21 ft. 6 in. The lowest point extending from stations 18 to 21 is 19 ft. 1 in. at the center. The sheer aft would in this case be 11 in., and forward 2 ft. 5 in. The sheer diagrams will be explained later on.

In order to secure the sheer at side reference must be made to the beam camber. This vessel's deck is crowned 10 in., and as long as the side remains parallel the sheer line at the side will be 10 in. below the line at center. The narrowing up of the deck changes the side line until it rises to the line at center, at bow and stern.

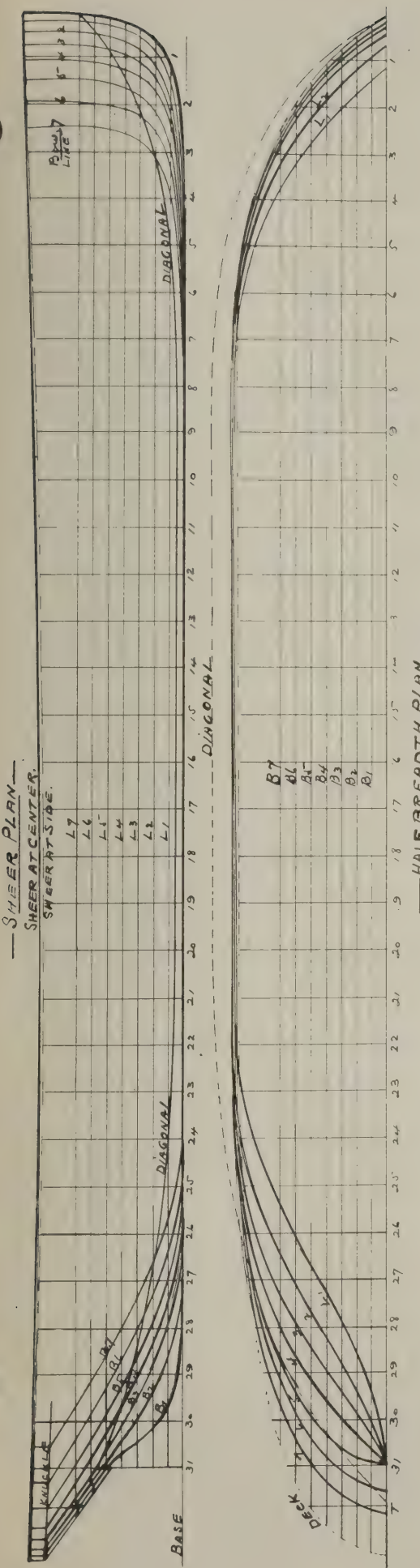
The width of the deck line must be run in on the half-breadth plan, and transferred to the beam camber. The difference between the top of the crown and the point of width secured from the deck gives the drop of sheer at side. The knuckle line is 18 in. below the deck line and run in parallel to the sheer at side.

Bow and buttock lines can only be secured after the stations have been faired in the body plan and level lines in the half breadth.

HALF BREADTH PLAN: A line parallel to the base of the sheer plan is run in at a suitable distance from the sheer plan, so that the lines of this plan will not cross the lines of the sheer plan.

The base line on the half breadth plan represents the center line of the ship. The stations are transferred from the sheer plan and the deck line run in as shown by dotted line. This deck line is a fixture and when the height of same is transferred, by means of the beam curve on to the sheer plan, it makes the height and width of deck fixtures.

Parallel lines are run in on this



PLAN 2—THE SKELETON OF THE SHIP

plan, which are termed bow and buttock lines. Level lines are shown curved on this plan, and where they cross the stations the points are transferred to the body plan. This process is repeated until the sections in the body plan and level lines in half breadth plans are fair.

BODY PLAN: A base line is drawn in and level lines run parallel to same; the base and level lines are the same as the sheer plan, the lines being extended to the body plan from the sheer.

Bow and buttock lines are run in parallel to the center line and spaced 24 in. apart. The stations are curved in this plan and are shown in their true form. Where the sections cross the level lines the points are transferred to the half-breadth plan and when made true shows the level line in its true form.

The sheer heights in the body plan are transferred from the sheer plan by simply measuring the depth from the base line on the sheer plan. The bow and buttock lines are transferred from the body plan to the sheer plan by measuring up on the buttock line to where the sections intersect same and when faired up in the sheer plan shows the bow and buttock lines in their true form. Another test for proving these lines is to raise perpendiculars from the half breadth plan and if they pass through the same intersections in the sheer plan there is little doubt of the fairness of the buttocks.

DIAGONAL LINES: This line is another test of fairness and a very useful one. The line is run straight in the body plan and transferred to the sheer and half-breadth plans. In the half-breadth plan this line extends beyond the other lines, as shown dotted in. On the sheer plan it cannot be mistaken for anything else.

When, after the points of two plans have been transferred to the third and show continuous curves without abruptness, the ship is considered fair.

Plight of a Tug

Editor MARINE REVIEW:—Noticing in the September number of your magazine the account of the remarkable stranding of the steamer City of Seattle, on the Pacific coast, I was reminded of a nearly parallel case which I witnessed. I happened to have the enclosed cut showing the incident, and you are welcome to it if you consider it of interest.

The tug is the M. Mitchell Davis, 85 tons gross, of Portsmouth, N. H., and she went ashore on Hicks Rock, in Portsmouth harbor, during a thick fog, on July 30, 1908. Unlike the City of Seattle, whose engines were stopped, the Davis was under one bell when she struck. In spite of this, she was absolutely undamaged and was not even drydocked, though she went on at extreme high water and laid

TUG M. MITCHELL DAVIS ON THE ROCKS

for one whole tide across a ridge of sharp rocks. Only the timber braced under her guards, which show in the picture, prevented her rolling off into eight fathoms of water.

D. A. WASSON.

Colorado Springs, Colo., Sept. 25, 1912.

Obituary

John Haug, consulting engineer and naval architect, died at his home in San Francisco, on Sept. 9. Mr. Haug was a native of Germany, and acquired his first experience in engineering work there. He later went to England and was associated with the late J. Macfarlane Gray, afterwards coming to the United States and entering into partnership with Mr. Archbold, who had been chief engineer to Commodore Perry's expedition to Japan in 1852. Mr. Haug was ship and engine surveyor to Lloyds, at Philadelphia, from 1880 to 1900, when he resigned to devote his time to consulting work. He designed ships and machinery and superintended construction for the Philadelphia & Reading Railway Co., the Red D line, the New York & Porto Rico Steamship Co., and the Chesapeake Steamship Co., and the Standard Oil Co. He was a pioneer in the introduction of bulk oil vessels and was greatly interested in the application of internal combustion engines to their propulsion.

Erie Railroad Transit Line Improvements

That the present management of the Erie railroad is rapidly advancing that property to the first rank position is well known and its progressive policy with regard to its floating equipment, has already been noticed.

The most recent step in this direction was the placing of contracts by the company's consulting engineers, Babcock & Penton, a few days since for a thorough remodeling of the machinery equipment of the steamers F. D. Underwood and Delos W. Cooke, formerly the Ramapo and Starrucca.

In several respects this decision is remarkable, if not radical. The alteration of ships of older types in order to improve their efficiency is not uncommon and the results are generally gratifying, but the practical discarding of a strictly modern plant is decidedly unusual. These ships are the newest of the fleet and their existing equipment is certainly not inferior to that of scores of others which are looked upon as fully up to date regardless of size. Careful tests, extending over the whole season, of the performance of other ships of the fleet which have undergone alteration have shown that a new mark has been set in economy of operation and have led to the decision to go still further. The outcome will be watched with interest. Figures supplied by the management, while incomplete for the year, show that the overall reduction in fuel cost per ton mile since 1910 is about 34 per cent, even with a speed increase of over 7 per cent.

In this connection it is of interest to note that another large fleet of strictly modern ships has been placed in the hands of the engineers above referred to for investigation and recommendations.

The contracts for the work on the Underwood and Cooke have been placed with the Lake Erie Engineering & Boiler Works, Buffalo, and in addition thereto a considerable amount of work will also be done by the line's own organization.

Lake Ship Building

The bulk freighter, James A. Farrell, named in honor of the president of the United States Steel Corporation and building for the Pittsburgh Steamship Co., was launched from the Lorain yard of the American Ship Building Co., on Saturday, Sept. 28, being christened by Miss Theresa Farrell. The Farrell is one of the three steamers building on the Isherwood system for the Pittsburgh Steamship Co., and is 600 ft. over all, 580 ft. keel, 58 ft. beam and 32 ft. deep, having triple-expansion engines, 24, 39 and 65 in. cylinder diameters by 42-in. stroke, supplied with steam from two Scotch boilers, 16 ft. by 11½ ft.

The town of Lorain honored the event by practically converting the day into a holiday, and the ship building company certainly did its part, serving luncheon to 300 guests in the mold loft immediately after the launching. James H. Hoyt acted as toastmaster. The address of Mr. Farrell showed a surprising familiarity with lake conditions and the coincident development of unloading appliances and modern bulk carrier. He spoke of the various products of the steel plant at Lorain and said that notwithstanding the fact that some of the employes accept employment elsewhere because of opportunity to work seven days continuously per week, the Corporation saw no reason to alter its belief that six days continuous work was sufficient and best for all interests. He also predicted prosperity for at least 12 months, no matter what happens meanwhile.

Addresses were also made by H. Coulby, president of the Pittsburgh Steamship Co.; J. C. Wallace, president of the American Ship Building Co., Col. H. P. Bope, vice president of the Carnegie Steel Co.; E. J. Buffington, president Illinois Steel Co.; Wm. B. Schiller, president National Tube Co.; Wm. P. Palmer, president of the American Steel & Wire Co.; Hermon A. Kelley, general counsel for the Pittsburgh Steamship Co.; Wm. A. Little, president of the Board of Commerce of Lorain, and Wm. E. Hughes, city solicitor of Lorain.

An interesting feature was the fact that the presidents of all the subsidiary companies of the Corporation were present, with the exception of Mr. Dinkey, of the Carnegie Steel Co. The list included, in addition to the ones mentioned above, J. A. Hatfield, president of the American Bridge Co. of New York; Daniel Coolidge, president of the Lorain Steel Co.; E. W. Pargny, president of the American Sheet & Tin Plate Co.; Edward M. Hagar, president of the Universal Portland Cement Co.; A. F. Banks, president of the Elgin, Joliet & Eastern railroad; W. A. McGonagle, president of the Duluth, Missabe & Northern railway; W. J. Olcott, president of the Oliver Iron Mining Co.; F. E. House, president of the Duluth & Iron Range Railroad Co., and August Ziesing, president of the American Bridge Co.

On Saturday evening, Mr. and Mrs. Coulby gave a reception and dinner at the Country Club in honor of Mr. and Mrs. Farrell.

President M. E. Farr, of the Detroit Ship Building Co. has closed contract for the construction of two bulk freighters, of Canadian canal size, for the George Hall Coal Co., of Ogdensburg, N. Y. The vessels will be 247 ft. long, 43 ft. beam and 21 ft. deep, and will be equipped with triple-expansion engines, cylinder diameters 18, 29 and 48 in. by 40-in. stroke, supplied with steam from two Scotch boilers, 12 ft. diameter and 11.5 ft. long.

The bulk freighter L. V. Stoddard, building for the Boston & Virginia Transportation Co., of Boston, was launched from the yard of the Toledo Ship Building Co., on Sept. 21. The Stoddard is a duplicate of the George E. Warren, which was delivered to the same company on Oct. 1. The steamers are of Canadian canal dimensions, being 260 ft. long, 43 ft. 6 in. beam and 27 ft. molded depth. They are intended for use in the coal carrying trade between Boston and Virginia ports. The Stoddard will be delivered about Nov. 1.

The Wilson Transit Co., of Cleveland, has given contract to the American Ship Building Co., to reconstruct the bulk freighter Andrew Carnegie, making her of arch construction with side tanks and 12 ft. center hatches. She will also have new boilers.

The Wyandotte yard of the Detroit Ship Building Co. was considerably damaged by fire on Sept. 28, entailing a loss of about $50,000. The new steamer building for the Cleveland & Buffalo Line was not damaged.

Praise for City of Detroit III

N. H. Campbell, general manager of the Hudson Navigation Co., went to Buffalo some time ago to inspect the City of Detroit III. He writes that he was very agreeably surprised at her size, decoration and arrangement and fittings of her rooms, adding that while he recently inspected the new liner La France, of the French Line, he believed the City of Detroit III to surpass her in workmanship and detail.

Iron Ore Shipments

Iron ore shipments during September were 7,287,230 tons, making total shipments to Oct. 1, 36,338,382 tons. This is an increase of 11,501,245 tons over the corresponding movement during 1911, and an increase of 1,237,518 tons over 1910. It is clear therefore that the movement for the season will

be in the neighborhood of 45,000,000 tons, as the shippers intend to make record movements during the months of October and November, should the weather be favorable.

Following are the shipments by ports:

Port.	Sept., 1911.	Sept., 1912.
Escanaba	668,595	770,974
Marquette	367,964	566,178
Ashland	368,945	757,764
Superior	1,563,836	2,031,086
Duluth	1,131,247	1,652,735
Two Harbors	1,130,482	1,508,493
Total	5,231,069	7,287,230
1912 increase		2,056,161

Port.	To Oct. 1, 1911.	To Oct. 1, 1912.
Escanaba	3,086,847	4,010,985
Marquette	1,568,711	2,567,578
Ashland	1,878,786	3,623,161
Superior	7,946,109	11,097,276
Duluth	5,501,364	7,729,187
Two Harbors	4,855,320	7,310,195
Total	24,837,137	36,338,382
1912 increase		11,501,245

Lake Ore Receipts

Out of total shipments of 7,287,230 gross tons of iron ore during September, 5,536,291 tons came to Lake Erie ports, distributed as follows:

Port.	September, 1912.
Buffalo	748,672
Erie	72,463
Conneaut	1,030,911
Ashtabula	1,281,361
Fairport	287,083
Cleveland	1,184,249
Lorain	527,834
Huron	46,238
Sandusky	.....
Toledo	301,770
Detroit	55,710
	5,536,291

Purchase of River Property

John W. Hubbard, of the Hubbard-Bakewell Co., and associates have taken over the vessels and dock property of the Pittsburgh & Cincinnati Packet Co. The new company has also purchased outright the Pittsburgh & Zanesville Packet Line with terminal property at Zanesville, McConnellsville, Beverly and Roxburg, O., and negotiations have also been practically concluded for the purchase of the Point Pleasant Dry Dock Co., Point Pleasant, W. Va., and it is understood that a second set of dry docks will be built there. The capital of the new organization is $3,000,000.

Commerce of Lake Superior

The commerce of Lake Superior for the month of September was 10,467,782 net tons, making the fourth month in which the 10,000,000-ton mark has been exceeded, and is only 385,071 tons less than the August movement, which was the canal's record movement for any one month. The commerce to Oct. 1 was 51,952,708 tons as against 39,438,167 tons 1911, an increase of 12,514,541 tons. Following is the summary:

EAST BOUND.

	To Oct. 1, 1911.	To Oct. 1, 1912.
Copper, net tons	83,312	73,784
Grain, other than wheat, bushels	21,912,198	29,781,501
Building stone, net tons	4,367	2,282
Flour, barrels	4,579,336	5,222,533
Iron ore, net tons	23,652,487	35,090,169
Pig iron, net tons	25,596	11,994
Lumber, M. ft. B. M.	403,644	487,852
Wheat, bushels	41,043,359	78,173,355
Unclassified freight, net tons	101,169	163,278
Passengers, number	35,054	29,899

WEST BOUND.

Coal, anthracite, net tons	1,485,087	1,321,452
Coal, bituminous, net t'ns	10,079,890	9,544,129
Flour, barrels	125	.....
Grain, bushels	1,100	100
M'n'f'ct'd iron, net tons	275,949	447,762
Iron ore net tons	12,622	6,660
Salt, barrels	480,277	486,719
Unclassified freight, net tons	882,971	946,675
Passengers, number	39,523	32,603

SUMMARY OF TOTAL MOVEMENT.

East bound, net tons	26,630,196	39,613,431
West bound, net tons	12,807,971	12,339,277
Total	39,438,167	51,952,708

The total number of passages to Oct. 1, 1912, was 16,543, and the net registered tonnage, 41,127,004.

Steamer Nantucket Turned Turtle

The accompanying photograph shows the steamer Nantucket of the Merchants & Miners Transportation Co.'s fleet in a most unusual plight. The Nantucket arrived at Baltimore on Sept. 2, and while discharging at the Baltimore & Ohio pier at Locust Point, smoke was discovered coming from the lower forehold, about five car loads of freight remaining in the ship at the time. The ship's fire appliances were immediately put into operation and a general alarm turned in, which was responded to by fire engines and fireboat. The fireboat ran a hose through a lower off-shore port and a great volume of water was pumped into the ship, which was moored to the dock. There is a slight sloping bank abreast the dock and as the ship settled in the water her port bilge took up the bank, giving her a slight starboard list. The great volume of water in the hold and on the upper 'tween decks then caused the ship to list rapidly before the lower port could be closed. When this port went under water the ship gradually settled on her starboard beam ends, as shown in the photograph.

The Merritt - Chapman Wrecking Co. are now raising the Nantucket. The fire damage to the ship is trifling.

THE MERCHANTS' & MINERS' TRANSPORTATION CO.'S STEAMER NANTUCKET TURNED TURTLE AT HER DOCK AT BALTIMORE AS THE RESULT OF A FIRE

Personals

E. L. Corthell, of New York, one of the best known American engineers, is now visiting Switzerland.

Harvey D. Goulder, general counsel for the Lake Carriers' Association, has left for Europe for a brief vacation.

Frederick L. Lane has been appointed general manager and treasurer of the Nantasket Beach Steamboat Co.

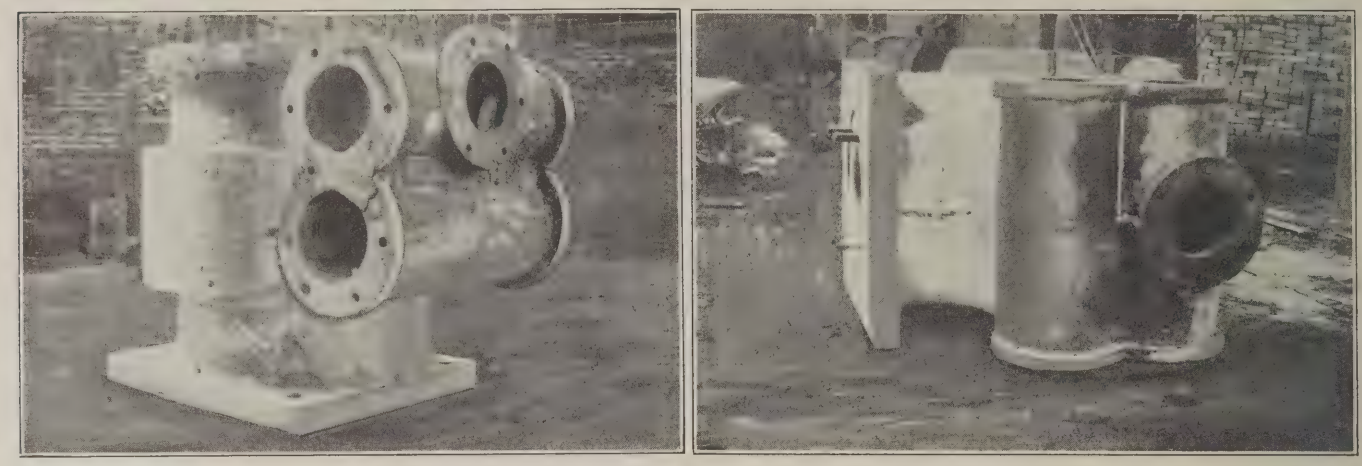
Thomas L. Delehanty, chief engineer of the steamship Admiral Dewey, has been appointed business manager of the Marine Engineers' Beneficial Association of the port of New York.

Capt. H. D. Doxrud, of the Red Star Liner Lapland, has been appointed to superintend the construction of the three new ships building at Birkinhead, England, and which are intended to operate in the New York-Norway service.

Dr. Edwin J. Clapp, assistant professor of trade and transportation in the New York University School of Commerce, has been appointed traffic expert by the directors of the port of Boston to devote a year to the study of transportation conditions in Boston and other Atlantic coast ports.

Cylinder Repaired by Welding

On the morning of Aug. 17 the cylinder on the tug Cooper, owned by the Great Lakes Dredge & Dock Co., showed a crack along half the length of the steam chest and across the top flange. The cylinder was removed at once, and taken to the shops of the Great Lakes Welding Co., of Cleveland, reaching there shortly after noon. The cracks were welded by the oxy-acetylene process, and the cylinder was back in place and the engine turning over by noon the following day. The repairs and the reassembling required just 24 hours. The welded cylinder was not only as strong as before, but far stronger, due to the heavy re-enforcement of metal that was built on the weak section which cracked.



CYLINDER OF TUG COOPER REPAIRED BY WELDING PROCESS

Since the job was finished, another cylinder of the same type, also belonging to a tug owned by the same company, went through itself, cracking off the entire top flange, shattering the piston and causing several small cracks on other parts of the casting, and even better time was made on the repairs by the same company and the cost of the welding was only a nominal figure, compared to the cost of new castings.

Some exceptional boiler repairs have also been made by this process. Several very large fire cracks in boilers of a number of steamers were repaired while the vessels were discharging their cargo. The great saving in time and money is bringing the process into favor with most of the vessel operators, the saving in time alone amounting in many cases to several days.

Tests of plates, welded, made by the local United States steamboat inspectors show tensile strength to be over 96 per cent of the original without re-enforcement. More recent tests made in the laboratories of the Case School of Applied Science show even better results—in fact, all the welded coupons broke outside of the welds.

Satisfactory Trials of Fordonian

The Clyde Ship Building & Engineering Co., Port Glasgow, Scotland, are building for Norcross & Co., of Toronto, a steamer of Canadian canal dimensions for service on the Great Lakes to be equipped with Diesel engines of the Carels two-cycle type. The new steamer is named Fordonian and has recently undergone some satisfactory trials, as the following letter from the shipbuilding firm to Carels-Freres, Ghent, under date of Sept. 23, will show:

"As you have doubtless heard from Mr. Gaston, who was with us on trial on Saturday, the engines we have fitted to the M. S. Fordonian had a very satisfactory trial on Saturday.

"We left our basin at 8 a. m. and as soon as we got into the river, the engines were started, and from that hour on until 9 p. m. they were not stopped excepting by orders from the bridge.

"During the whole of the 13 hours the behavior of the engines was entirely satisfactory, and all the visitors we had on board were immensely pleased with what they saw. After running on the mile for some hours and testing the speed of the ship, the superintendent engineer, Mr. Duguid, wished to put the engines under some maneuvers, which he said was something like what they were accustomed to in going through the canals in the Canadian lakes. Mr. Duguid was sumewhat suspicious that the air supply would not be sufficient to give the number of maneuvers necessary for their business out in Canada. The test was a particularly severe one, and for 40 minutes the engines made 61 maneuvers. It was a much more severe test than ever we have seen a steam engine put to, but the engines stood the test satisfactorily.

"For the trial we had invited a number of our friends, most of them influential people in the engineering world, and we had a representative from the British admiralty, who had instructions to make a special report for the first lord of the admiralty, and we had representatives from the imperial Japanese navy. We had engineers from Australia, from Canada and from quite a number of the big ship-owning firms of Great Britain and Ireland. Everyone present was more than delighted with the behavior of the engines, both in their steady working and their maneuvering capabilities, giving them quite a new idea of what a Diesel engine is.

"We are entirely satisfied with the trial, and you will no doubt be equally pleased to hear that this, the first engine we have done, has come out of its trials so successfully."

The Hamburg-American Line has asked for an extension of its piers at Hoboken on the ground that its present piers are not long enough to accommodate the new liner Imperator, which will make her maiden voyage to this country next April. In its application the Hamburg-American Line makes the announcement that the two sister ships which will follow in 1914 and 1915, will be even larger than the Imperator.

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One Williamson Bros. Combined hand and steam steerer with stand and valve operating levers. Size of cylinders 7" x 7". In perfect condition. Price $300.00 cash. Cost price $1200.00. Address

JERRY McCARTHY & SONS
157 Ohio Street **Buffalo, N. Y.**

What It Is And What It Can Do

"Thermit" is a mixture of finely divided aluminum and iron oxide which when ignited burns up and produces liquid steel at a temperature of 5,400° F. This poured into a mold surrounding a broken section and owing to its intense heat dissolves the metal with which it comes in contact, amalgamating with it to form a homogeneous mass when cool.

It Welds

Broken Sternposts, Rudderposts, Rudder Frames and all other heavy wrought and steel sections. Very little dismantling is necessary.

¶ The welding is accomplished quickly, returning the vessel to service in a few days, saving a great deal of time and expense.

¶ Our pamphlet 25-E and "Reactions" are interesting to read. Send for them.

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These boilers hold the record for economy, capacity and endurance in the Navies of the World.

They have shown the same characteristics in the Merchant Marine. Babcock & Wilcox Boilers and Superheaters in one vessel are *saving more than 15 per cent.* over Scotch boilers in sister vessels.

Is a reduction in your coal bill of any interest to you?

Babcock & Wilcox Boilers have all essential parts heavier than corresponding parts in Scotch boilers, giving greater security against corrosion. They are lighter, safer, easier to clean and to operate than Scotch boilers, and much more efficient.

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INSURES QUALITY

Grades—Best, U. S. Navy, and Navy, both Spun and Unspun.

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Let us hear from you at once.

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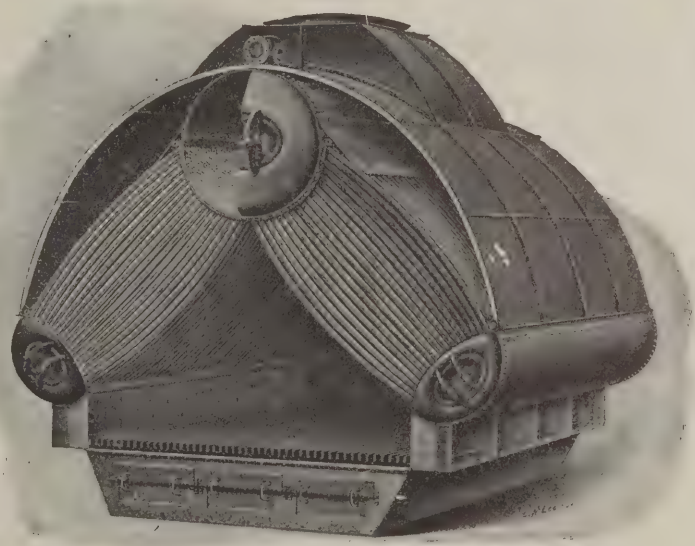
JERSEY CITY N.J.

Mosher Water Tube Boilers



Adapted for the highest grade service, Torpedo Boats, Destroyers, Battleships, and large commercial vessels. Steam drums up to six feet in diameter, larger water and steam room capacity than any other boiler.

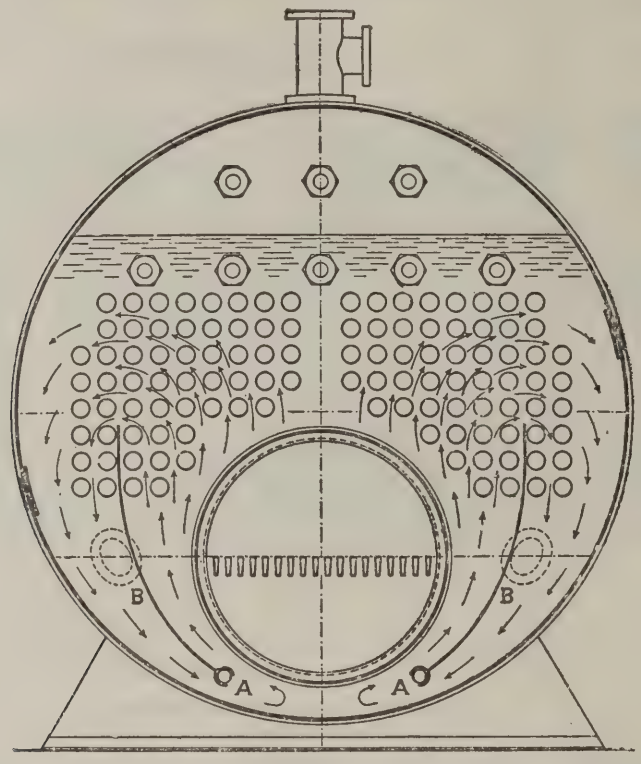
Any tube can be replaced without disturbing any others. Fifty tubes removed through one hand-hole. Curvature of tubes just sufficient to avoid expansion troubles. Greatest facility for cleaning interior and exterior of tubes. No screwed joints, all tubes expanded. All parts of wrought steel. Send for catalogue.

MOSHER WATER TUBE BOILER CO.
30 Church Street, NEW YORK

Copeland Automatic Circulating System

An interesting circular on the subject of circulation of water in steam boilers has just been issued by the E. T. Copeland Co., 100 William street, New York, proprietors of the Copeland patent automatic circulator and system for marine and stationary Scotch boilers. The circular opens with a general description of the Scotch boiler which has done reliable service for the past 50 years, but whose lacking quality is that of natural circulation of its water contents, causing it to lose a portion of the calorific value of the coal consumed. The Copeland patent automatic circulating system is a simple structural addition to boilers of the Scotch type, which, it is claimed, will establish and maintain natural circulation. It consists of two rectangular plates of steel or other metal of such length as to extend from head to head of the boiler and of such width that when in position they will extend above and below the grate level or fire line. They are erected edgewise upon suitable means of support located below the grate line. The plates are curved to correspond approximately with the radius of the furnace. They are designed to reach from a point near the center of the bottom of the boiler to an indeterminate point above the bottom course of fire tubes. The method of supporting the plates is shown in the diagram accompanying. Tubes AA support plates BB and incidentally supply hot air to the combustion chamber.

The tubes are inserted and expanded in the heads in the usual manner. Bolts, rivets or other fastenings are not employed. When properly placed each plate becomes a partition which sub-divides the space between the furnace and the shell, so that a definite and undisputed pathway is provided for an uprising current on the inside, and a down-flowing current on the outside. Its inter-position permits the water to move in diverse directions without conflict: and the respective influences of heat and gravity force it to follow a certain course, and to make a complete circuit. It is obvious that the water contained between the plate and furnace, adjacent to the fire, will be directly and continuously heated, and its density thereby reduced. It will, therefore, naturally rise and be coincidently followed by water from below. This is the starting point of the uprising current above mentioned.



Tubes A A support plates B B and supply hot air to combustion chamber.

On the other hand, the water in the space between the plate and the shell, being out of touch with heating surfaces, and also in contact with the shell, loses, rather than gains, heat, and its density is consequently increased. It therefore follows the law of gravitation and naturally descends, via the pathway provided for its transit, to the bottom of the boiler, where it turns the foot of the division plate, and meets the demand of the uptake for a constant supply of water for re-submission to the heating surfaces.

It is contended that the device establishes and maintains natural and complete circulation throughout the boiler; beginning immediately upon starting fires, and operating automatically and continuously until the fire is extinguished.

Trade Notes

The National Tube Co., Pittsburgh, Pa., has just issued a booklet on modern welded pipe, and in conformity with all the publications of this company, it is a fine example of the printer's art. The book is, in fact, a history of the industry and is replete with information concerning modern tubular products. The company has enormously expanded during the past decade, its production of tubular goods in 1900 being 416,064 tons and in 1909, 1,013,071 tons. The book traces the process of manufacture from the ore in the ground, and is therefore of great interest even to the layman. In order to identify its products, the company follows the practice of rolling in raised letters of good size on each few feet of every length of welded pipe the name "National," except, of course, on the smaller butt-weld sizes, on which this is not mechanically feasible.

A valve-closing water-tight receptacle has been introduced by the Conlan Electric Co., of New York, the valve being employed in place of the portable cover to close the opening disclosed by the removal of the plug. The closing action of the valve and valve spring is also used to make a quick break of the electrical connections when the plug is withdrawn. Another strong feature is in the cam means of connecting the plug to the box, which compresses a gasket (carried by the plug) on the face of the box, making a water-tight joint. Therefore, the operator, who is usually unskilled, is not required to do more than to make and break the electrical connections, as the box is made water-tight automatically. The United States army have adopted the device exclusively, and it is also used on United States battleships and on steamships and yachts.

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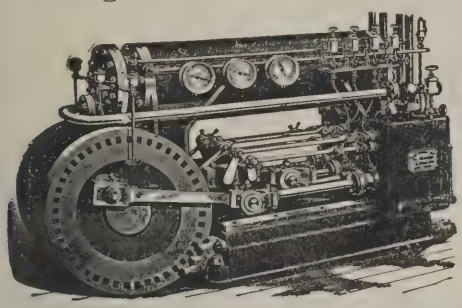

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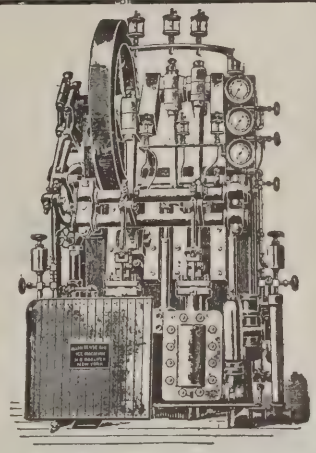

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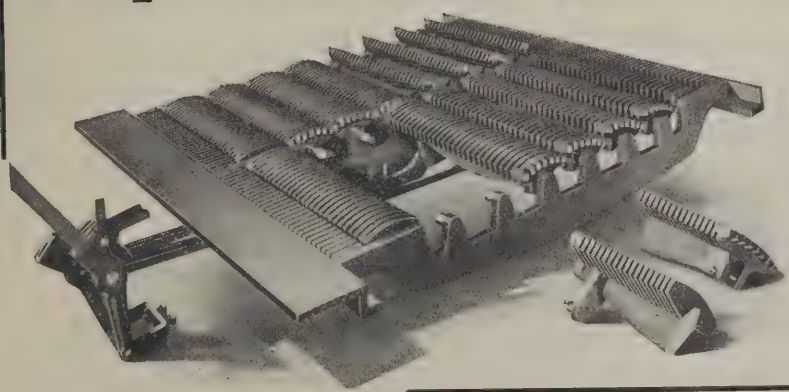

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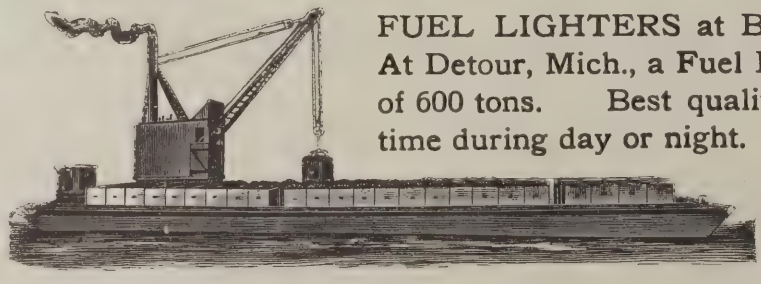

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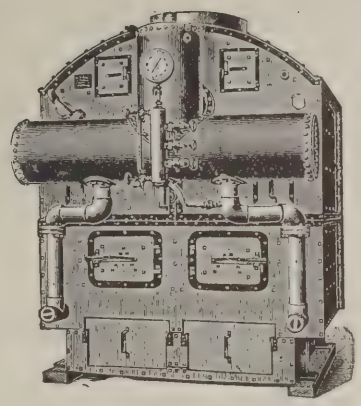

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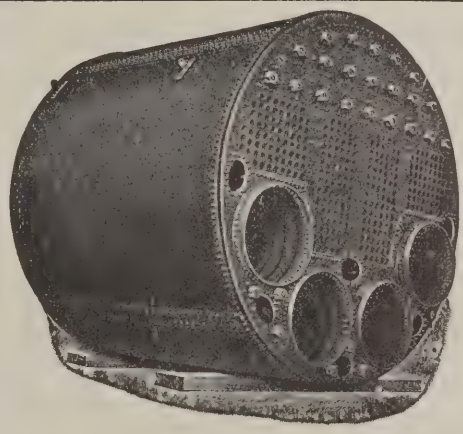

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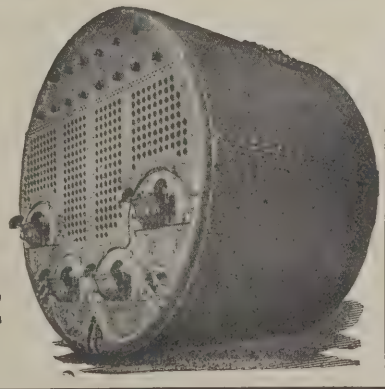

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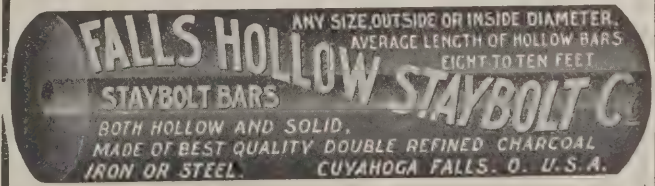
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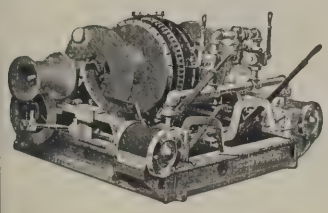

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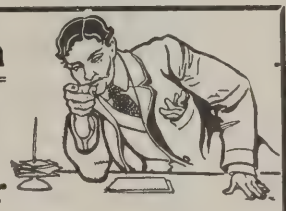

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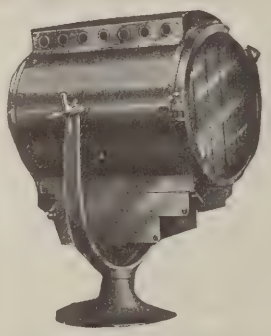

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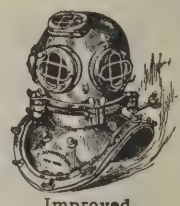

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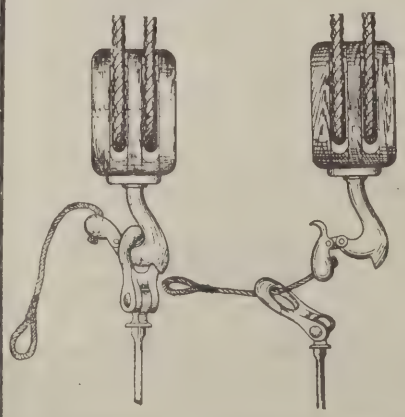

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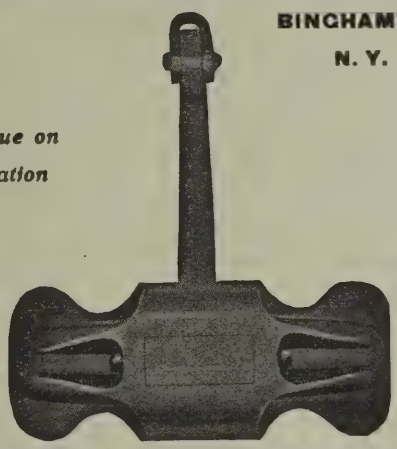

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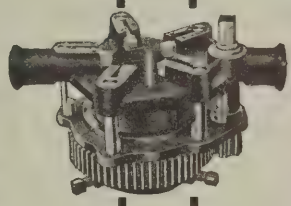

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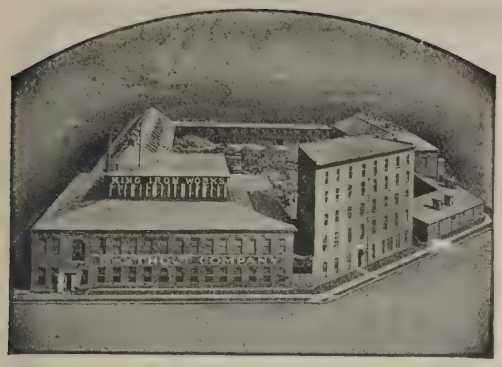

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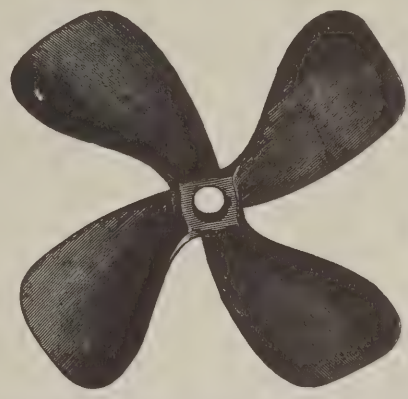

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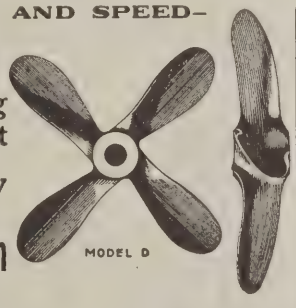

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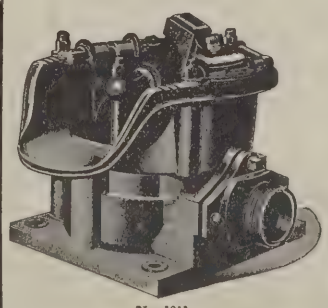
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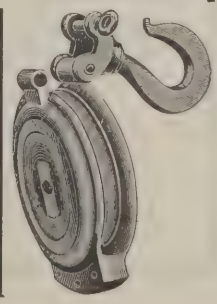

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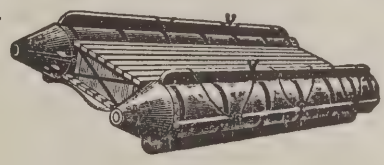

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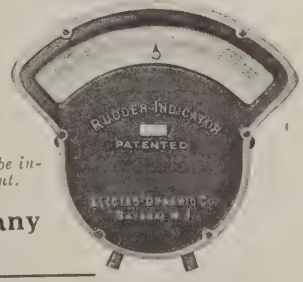

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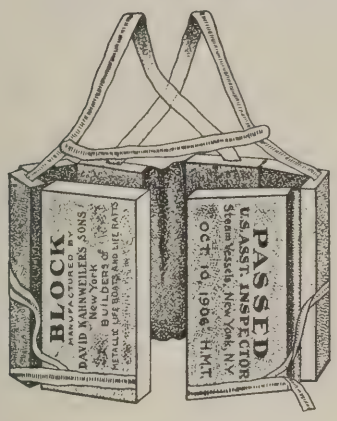

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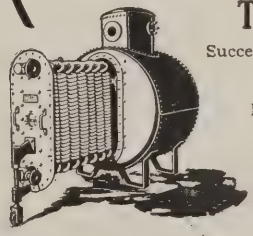

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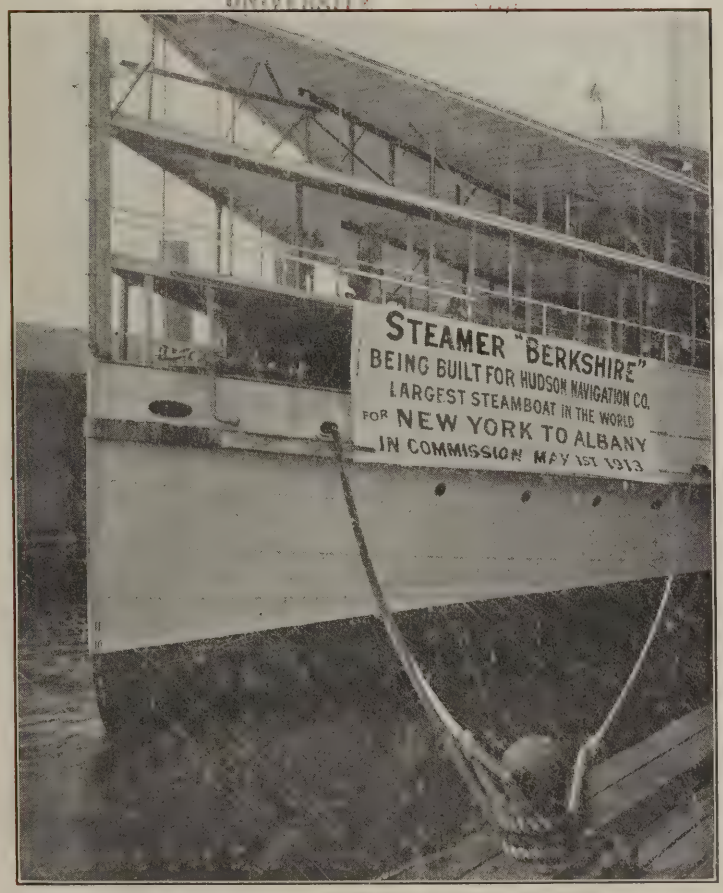
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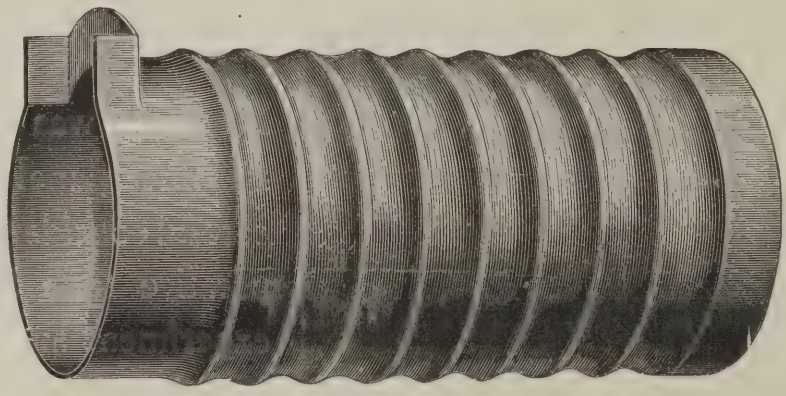

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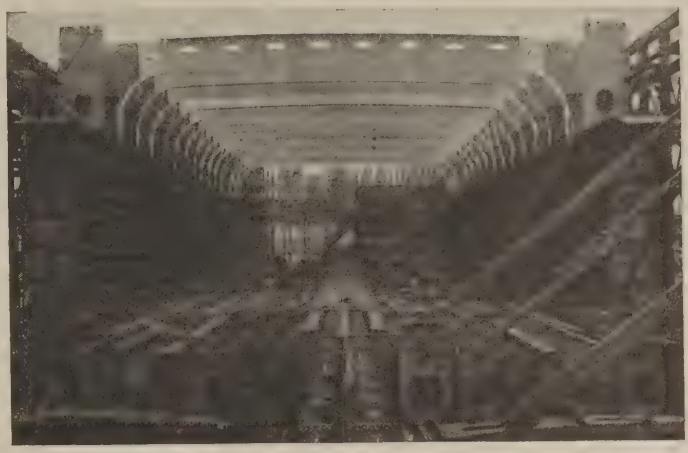

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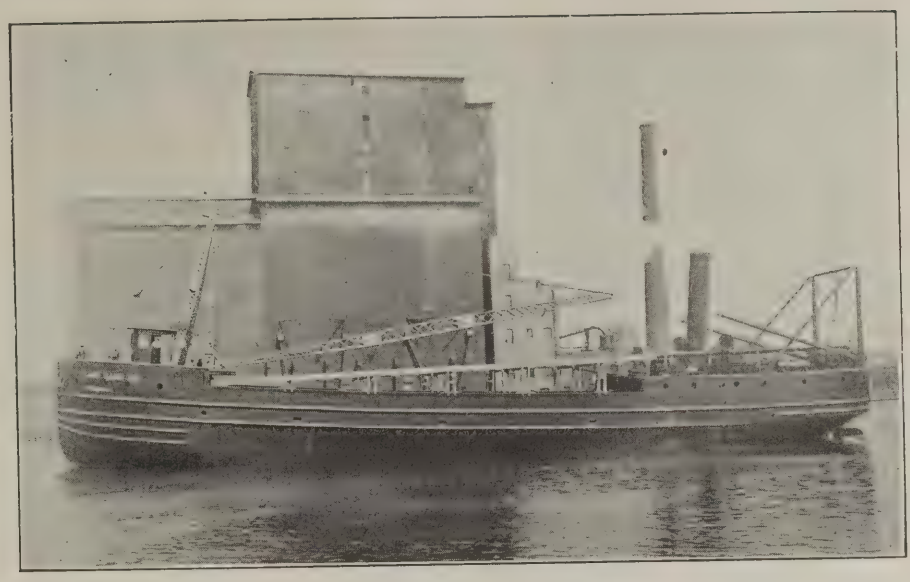

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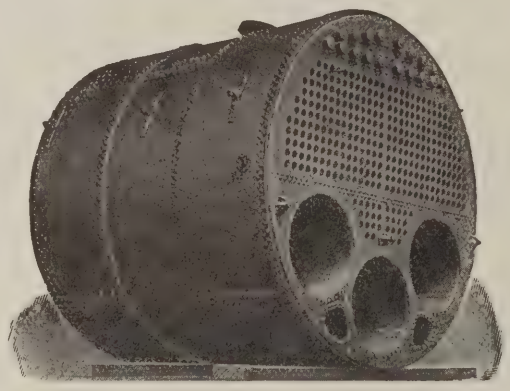

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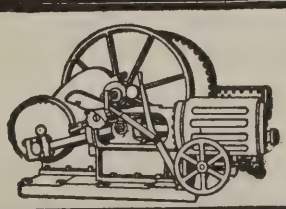

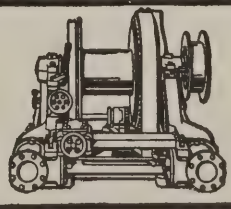

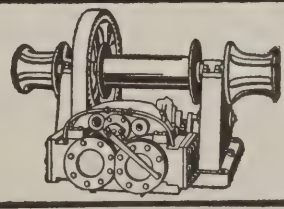

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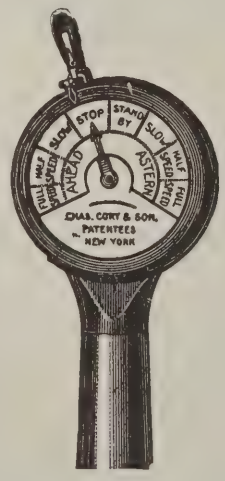

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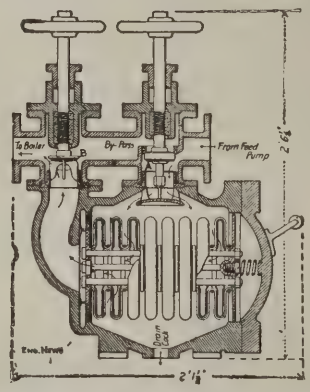

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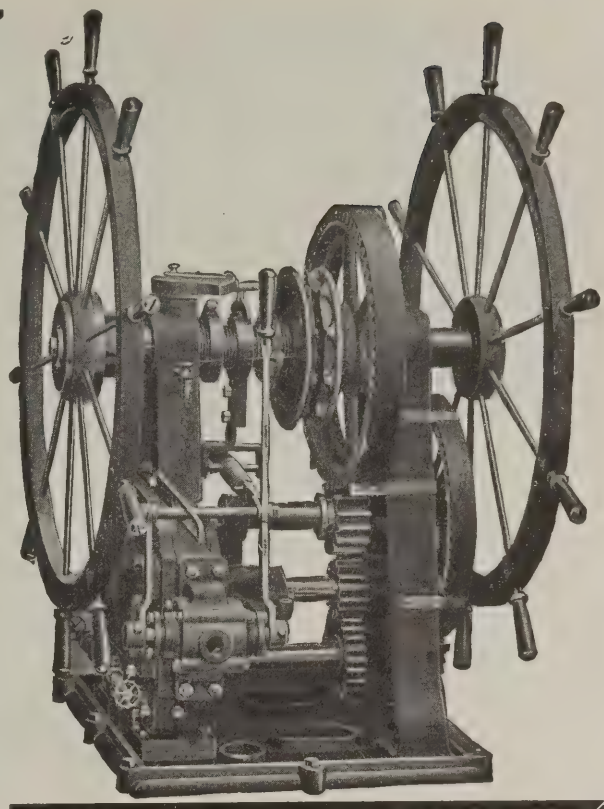

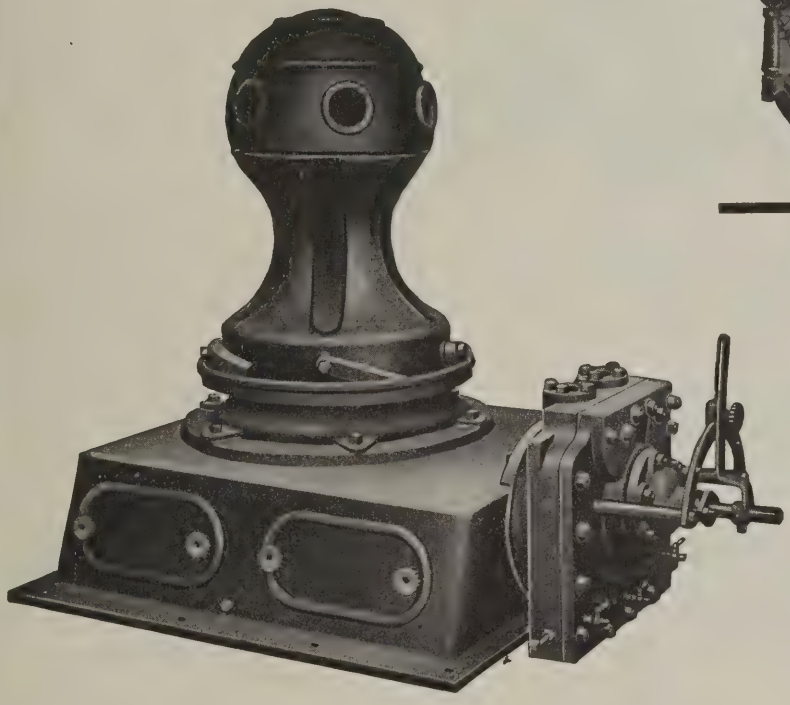

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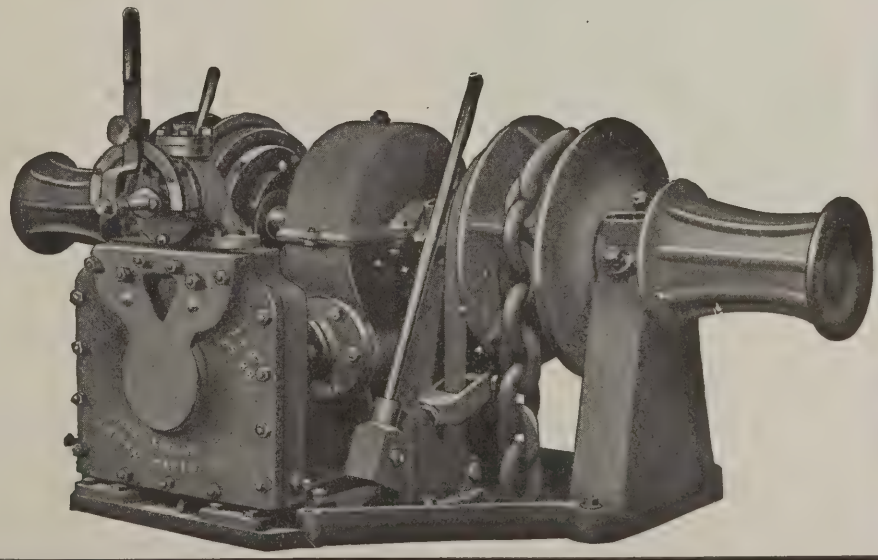

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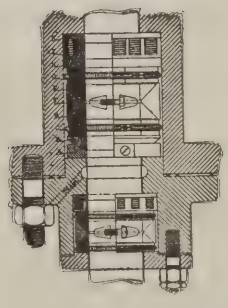

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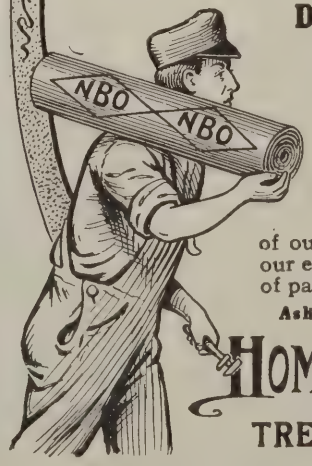

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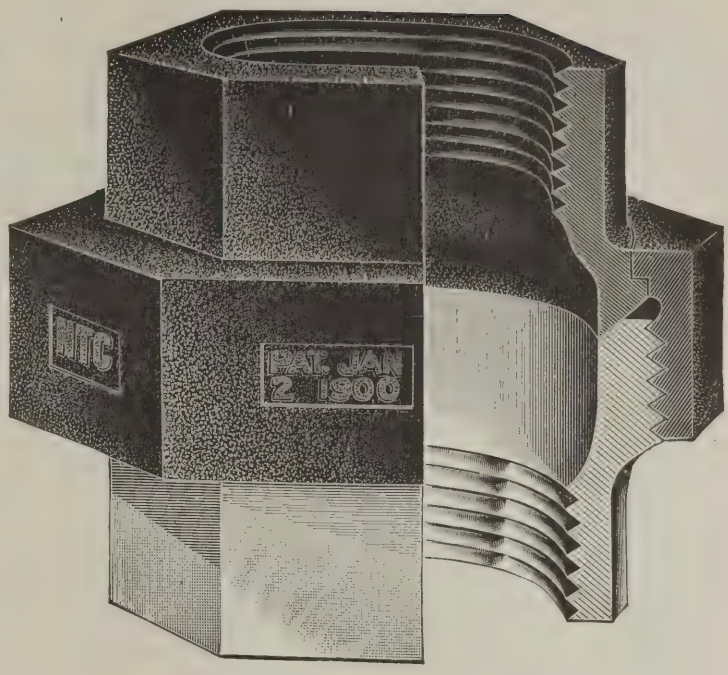

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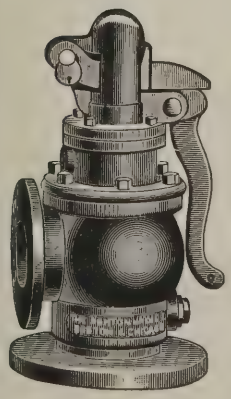

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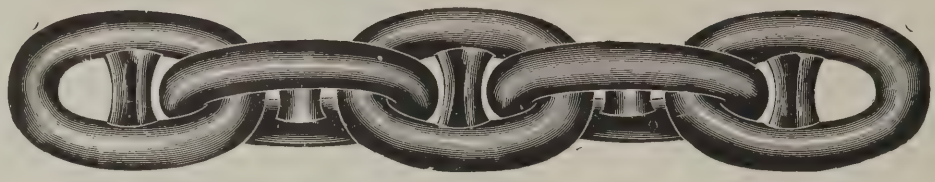

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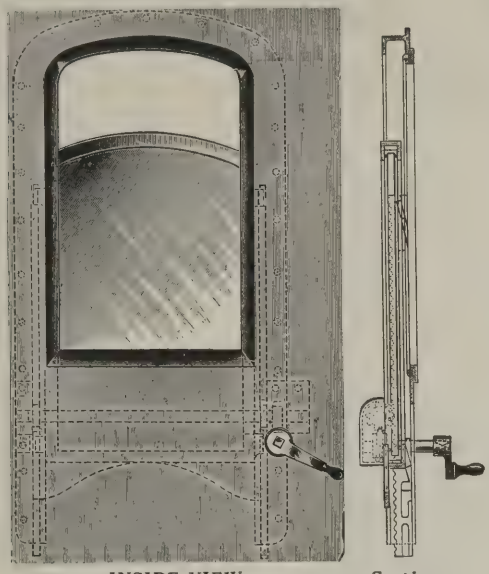

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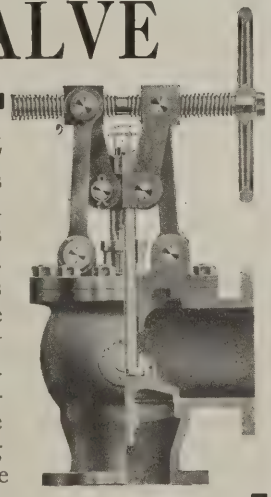

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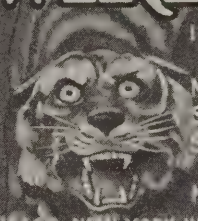

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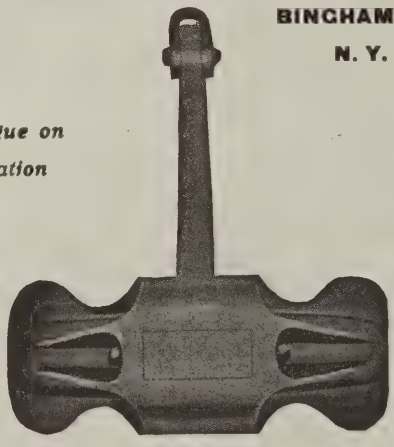

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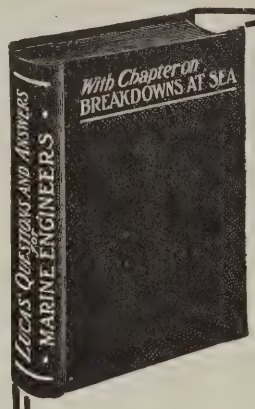

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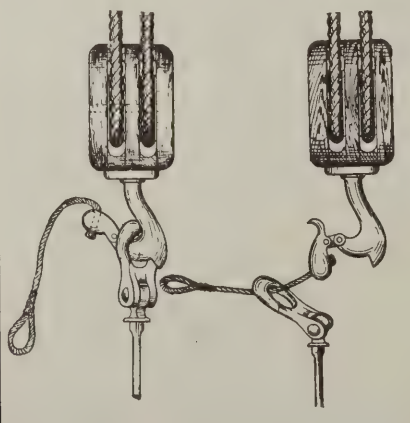

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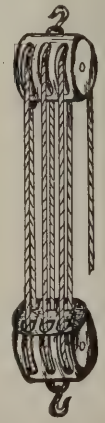
Releasing Hook

Extremely simple. Quick, safe and ***reliably automatic***---thus enabling crew to get boat away quickly. Hooks will not release until boat becomes waterborne, eliminating all danger of inopportune release. This device not only releases the boat, but it can be hooked on in a bad sea or on a dark night without injury to the hands of those hooking on. This important feature is possessed by no other device. Hooks, if desired, will be sent to the block maker and shackles to the boat builder.

"Star" Non-Toppling Block Device

Absolutely prevents capsizing and fouling, keeps the blocks clear and in vertical position in readiness for quickly hooking on—remaining so until boat is hoisted inboard. Made of galvanized iron. Fits your old blocks. Send for prices.



JAMES R. RAYMOND

No. 8 BRIDGE ST., NEW YORK

Geo. B. Carpenter & Co., Chicago, Ill., Sales Agents for the Great Lakes Section

WHAT J-M BOILER PRESERVATIVE WILL DO

It will remove scale already formed in a boiler.
It will prevent more scale from forming.
It will prevent the formation of scale in any water, in any locality, and under any temperature.
It will prevent injury to boilers from water containing sulphur.

WHAT IT WILL NOT DO

It will not injure iron.
It will not evaporate from boiler.
It will not affect the engine packing or lubricants or the products of a plant which may come in contact with the steam.
It will not cause boiler to foam or prime.
It will not cause any kind of trouble.

It Must Remove Old Scale and Prevent New Scale From Forming or We Refund Your Money

We will send you enough J-M Boiler Preservative for a 60 days' trial. If it does not do as claimed when used according to directions, we will credit you with full amount of charge.

J-M Boiler Preservative

is different from others---its action is mechanical and natural as well as chemical.

J-M Boiler Preservative is attracted to the plates and tubes of a boiler---gets under the scale and loosens it, so that the scale is readily washed or blown out. It then forms a coating to which scale-forming elements will absolutely not adhere.

Our claims are based on experience. We cannot afford to injure the reputation we have built up in the last half century.

Fill out the attached coupon and mail to our nearest branch today.

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You may ship us via ..... enough J-M Boiler Preservative for 60 days' trial in our plant. If we find that it does not do as claimed, you are to refund the full amount paid for same. We have .....boilers. H. P. each ..... Operate.....hrs. per day.

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IMPORTERS AND MANUFACTURERS OF

MAHOGANY

WHITE MAHOGANY

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High Grades of Kiln Dried Woods for Cabin Work and Inside Trim

THE Proven Power of The Marine Review to Produce Results is used as an argument to ask for your advertising.

This paper is the paper of the marine industry. It goes to men who are "Doers" in marine affairs. They buy it and read it for business reasons---**it is their paper.**

It is the once-a-month opportunity for the advertiser to say his say to the men responsible for results in the marine field---everywhere.

Sensible and adequate use of its advertising pages will make a tangible increase in the sales end of your business. It is an unsurpassed sales promoter for its advertisers.

Straws show the way the wind blows---liner ads. are true weather cocks too.

There's always a steady gale of business blowing around our classified advertising service pages---blowing quick returns to the advertiser.

THE MARINE REVIEW is the only marine journal that makes a feature of classified advertising---it's a big feature too.

Liner ads. come from all sources---always unsolicited. Anything that commands unsolicited business now-a-days is significant, to say the least.

The advertiser who has something to sell---the advertiser who wants to buy---just naturally puts his wants in these classified advertising pages.

And here's the usual result:

Duluth, Minn.,
July 15th, 1912.

The Marine Review,
Cleveland, O.

Dear Sirs:

I have sold the Tug Constitution, to R. P. Thompson, of Port Huron, Mich., through my one little ad in Marine Review.

Thank you ever so much.

Yours truly,
James Magee.

The paper that carried the most liner advertising business is invariably the best display advertising medium too.

It is so with newspapers as well as trade papers. It is a sure symptom

So to you who have things to sell to the marine trade and want them to know it we unhesitatingly say

---"THE MARINE REVIEW."

Otherwise---otherwise.

Facilitate Freight Handling

Good illumination is one of the most important factors in the consideration of speedy freight handling.

With good illumination, stevedores can better see what they are about; superintendents can oversee work better; unnecessary movements are eliminated. Further, adequate lighting prevents errors, delays and accidents.

The Long Life Flame Arc Lamp

TYPE W

gives a wide distribution of light over large areas. This lamp is recognized as one of the most powerful lighting units known.

Its thorough reliability ensures a continuity of service. On a multiple circuit the lamp will burn for over 100 hours without attention and even then it is necessary to change only one electrode.

Write for further details regarding this highly efficient and economical lamp.

General Electric Company

Largest Electrical Manufacturer in the World

General Office: Schenectady, N. Y.

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Dayton, Ohio
Denver, Colo.
Detroit, Mich.
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Erie, Pa.
Indianapolis, Ind.
Kansas City, Mo.
Keokuk, Ia.
Knoxville, Tenn.
Los Angeles, Cal.
Louisville, Ky.
Memphis, Tenn.
Milwaukee, Wis.
Minneapolis, Minn.
Nashville, Tenn.
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For Texas and Oklahoma business refer to General Electric Company of Texas—Dallas, El Paso, Houston and Oklahoma City.
For Canadian business refer to Canadian General Electric Company, Ltd., Toronto, Ont.

3328

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Marine Engines Hydraulic Dredges
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ECORSE PLANT—Ship Building—Dry Docks—Repairs

ASHTABULA PLANT—Ship and Engine Building—Dry Docks—Repairs

DETROIT PLANT—Engine Building and Repairs

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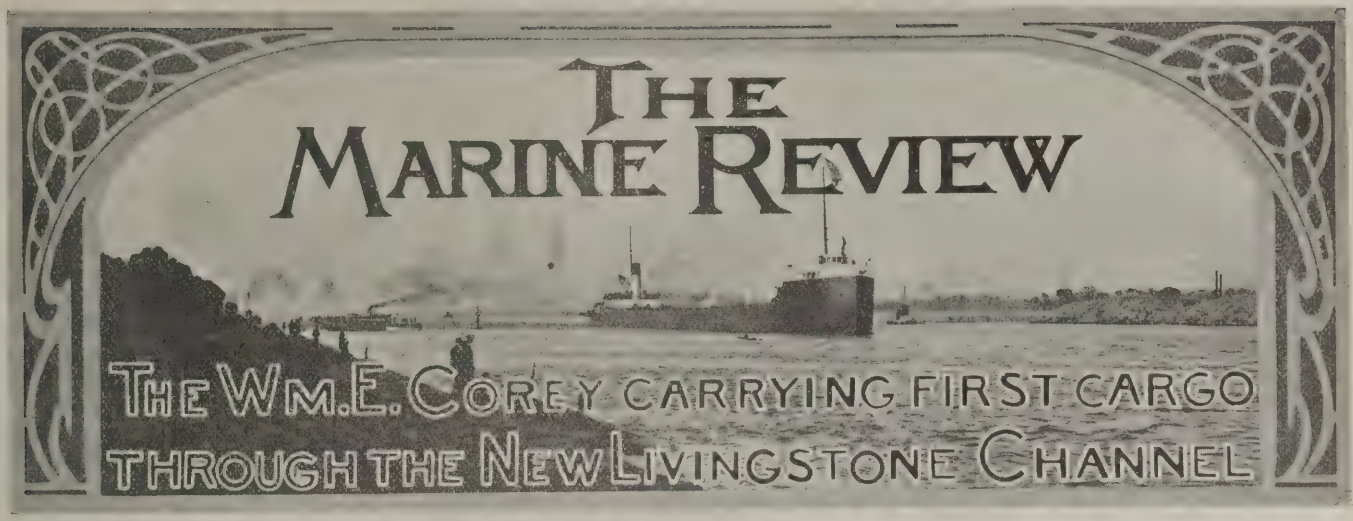


VOL. 42 CLEVELAND NOVEMBER, 1912 NEW YORK No. 11

Bulk Freighter Keybell

JAN 4 1927

Description of the First Vessel Which the Keystone Transportation Co. Has Built in Canada

THE Collingwood Shipbuilding Co., Collingwood, Ont., has recently completed the bulk freighter Keybell for the Keystone Transportation Co., of Montreal. Considering the great difficulty which the shipbuilding company had in obtaining material, owing to the crowded condition of the mills, the steamer was built in remarkably short time. The contract was signed April 4, the launch took place Sept. 17, and the vessel was turned over to the owners on Oct. 15. She is built to the classification of the British Corporation for the Survey and Registry of Shipping, of which Capt. James B. Foote, of Toronto, is the Canadian representative.

The steamer's dimensions are:

Length over all	258 ft.
Length B. P.	244 ft.
Breadth, moulded	42 ft. 6 in.
Depth, moulded	20 ft.

The vessel is built on the arch and web frame system, dispensing with hold pillars, leaving the holds unobstructed, facilitating the handling of bulk cargoes of coal and ore with clam-shell unloaders. The arches and webs are spaced 24 ft. centers, the arch plate being 30 in. deep of 15 lbs. plate, connected to web frame of same weight, 22 in. deep, with large bracket at tank margin, these with the deep floor plate in double bottom forming a belt frame around the ship. These arches, being connected to the main deck plating by large brackets, also support the main deck beams, making ample provision for heavy deck loads of pulpwood. The regular framing, between the webs, consists of solid 13-lb. plate floors in double bottom, space 4 ft., with intermediate angle floor frame and reverse frames, side frames 7 in. and 18-lb. channel spaced 2 ft., well bracketed to tank margin and to main deck beams of same section and spacing, to take the strains incident to canaling. The frames for 40 ft. from stem are spaced 18 in. centers, which, with the numerous panting beams and the panting stringers, afford additional protection to the hull against ice damage. The bottom framing is supported longitudinally by three lines of 13-lb. plate intercostals and the side framing by three lines of side stringers, composed of channel bars intercostalled to shell. The bottom shell and the tank top plating is exceptionally heavy for a vessel of this size, as a margin against bottom damage on full canal draught and damage to the double bottom plating by the heavy grab buckets now in use. The tank margin at its junction with the shell is below the level of the tank top, providing a capacious bilge well, into which the bilge suctions are fitted, as a precaution against leakage through damage to side shell in locks finding its way into the cargo holds, the bilge ceiling being fitted watertight. The forward hold, which is most liable to this sort of damage, has been fitted with grain ceiling as a protection against moisture, this being fitted in hatches and arranged, by an ingenious system of bolting, to be easily removed for inspection and painting of the adjacent steel work.

THE KEYBELL, LOOKING AFT

Five bulkheads are fitted, three watertight and three screen, the cargo hold being divided into three compartments. An additional partition

THE KEYBELL, LOOKING FORWARD

bulkhead is fitted between the boiler and machinery spaces. All deck houses and machinery casings and the engine skylight are steel, the deck over the after house being extended to shelter main deck.

The stem, stern frame and rudder frame are of wrought steel, the stern frame being scarphed below the boss to facilitate repairs in case of damage to the shoe, the scantlings of the latter being also very heavy. The rudder is of the side plate type, with counterbalance, coupled to the head below counter, the coupling being designed to permit of unshipping the rudder without disturbing the steering gear keyed to the stock above.

Location of Machinery

The machinery is located right aft, the engine being bedded on the tank top, and the scantlings of the double bottom increased in way of engine bed to afford rigid foundation. The boilers are also placed on the tank top, with firehold at forward end of boiler space. The bunkers, with capacity for 140 tons of coal, are located on the main deck over the boilers, arranged to coal from spouts through hatch in cabin deck, with saddle-back chute into the pocket bunkers at each side of firehold.

A second deck is fitted for a short distance aft, the starting platform, from which the main engines are handled, being at the same level with the engineers' store and tool rooms at aft end of machinery space.

Watertight scuttles are fitted in the main deck, over cargo bulkheads, with Jacob's ladder to holds, and a wrecking well of steel plate fitted in two of the holds.

Five cargo hatches, each 28 ft. 6 in. by 12 ft., spaced 24-ft. centers, and the after hatch 28 ft. 6 in. by 20 ft., afford ample facilities for the rapid handling of cargo. The hatch covers are of 3-in. Norway pine, supported by strongbacks and fore and afters of rock elm and are provided with double tarpaulins of waterproof canvas.

There are two steel masts with one cargo derrick fitted to the fore, and two to the main mast, of three tons capacity, with cargo whips led to 6 in. by 8 in. single-drum hoisting winches of Collingwood Shipbuilding Co.'s design, the running gear being of flexible crucible steel wire in B. & L. blocks.

A fender of 11 in. by 9 in. rock elm is fitted, full length of the ship, just above the load line, and another of same scantlings, around the stern at main deck level.

The double bottom is divided by watertight cross divisions and watertight center keelson into seven compartments for water ballast, these with the fore and after peaks totaling 990 tons.

Auxiliary Equipment

The ballast pumping arrangements consist of a 9 in. by 10 in. by 10 in. duplex vertical ballast pump, placed in the lower engine room on port side of ship, piped to pump, through manifold placed at forward end of engine room, into or out of each compartment of the double bottom, the suction to each low pressure being a 5-in. wrought iron pipe. Two bilge pumps driven directly from low-pressure cross-head are connected up to a special bilge manifold having 2½ in. suction to bilge wells in each hold and in boiler space. A 6-in. flood valve is fitted in the tank top in forehold for purpose of flooding or draining the hold. There are also two 6-in. hold drains located in No. 3 hold to draw from off the tank top in the cargo space and connected to main ballast manifold. The plumbing system throughout the vessel is supplied by a 4 in. by 4 in. by 5 in. horiontal duplex sanitary pump in the engine room, three large fresh water storage tanks being connected to this line for use in port, affording an ample supply of pure water at all times.

The steering gear is by Messrs. John Hastie & Co., Greenock, the engine being placed aft on lower deck adjacent to the engine room and direct connected to the quadrant, which is on the Wilson-Pirrie principle. The gear is controlled from stands in pilot house and on bridge by wire rope transmission and a hand gear, with two large teak wheels, is fitted at after end of cabin deck to control the vessel, when in an emergency, the forward gear is thrown out by a clutch. A spare tiller and relieving tackles are also supplied, connected to rudder head above main deck.

An Emerson-Walker patent quick-warping direct-grip windlass is installed on the forecastle head, the ground tackle consisting of two 36 cwt. Bower anchors, one stream and one kedge anchor, all Sykes Britannic stockless, with chain cables and steel wire hawsers to requirements of the British Corporation, the Bower anchors being arranged to stow in anchor pockets, entirely within the hull. The deck machinery, in addition to the hoisting winches already mentioned, consists of two mooring machines, by the builders—one 8 in. and 10 in. double-drum placed on main deck amidships, and one 6 in. by 8 in. single-drum right aft on the main deck, the chocks and other accessories being arranged about as usual in canal steamers.

A steel snubbing cable is fitted with

reel on forecastle head, controlled by an Angrove cable compressor, for warping in the locks. The spars consist of a spear pole at stem head and flag poles forward and aft. The outfit includes two 22 ft. Watts metallic lifeboats, equipped with Huff's patent disengaging hooks, placed on cabin deck under davits arranged to travel transversely, with links and guides, which permits of more rapid handling of the boats than by means of swinging davits and also avoids placing davits and boat skids close to rail, where they are always liable to damage when lying alongside docks or other vessels. A complete outfit of life saving apparatus, fire hose, etc., to pass government inspection, has been supplied, also awnings over pilot house, over main deck forward and over crew's quarters aft, oil and electric signal lamps, cabin lamps, navigating instruments, flags, mate's and carpenter's stores and cooperage.

Cabin Arrangements

The accommodations for officers, owners and crew are first-class, the after house containing galley, pantry, refrigerator and crew's mess, dining room and quarters for chief and second engineer, steward and oilers and firemen. The dining room is panelled in oak, with panelled pine ceiling and the officers' rooms finished in birch. Floor in galley is of cement with wood floors covered with linoleum in living rooms. Trunk skylights are fitted over dining room and galley and screens provided for all doors and windows. The quarters forward under forecastle deck, contain, on the port side, mates', wheelsmen's, deckhands' and watchmen's rooms, store and officers' bath and crew's hall. On the starboard side are the owners' quarters, consisting of a sitting room entered from the main deck, two staterooms and bath. Above this, on the forecastle head, is the texas, containing captain's office, stateroom and bath, and forward of this, a handsome observation room for the owners' use. The captain's and owners' rooms and the observation room are half panelled in birch, mahogany finish, with V. G. wainscot and wide base and chair rail below, the ceiling being panelled in pine, painted flat white, this making a very fine finish. Above the texas is the pilot house, arranged particularly for canal service, of ample proportions and with a good area of glass, providing for the navigation of the vessel from the inside, the engine and docking telegraphs being placed here. Speaking tubes lead from pilot house to deck over and to captain's room.

The plumbing and heating installation is first class in every particular and ample for the service. Running hot water is also provided in the galley, captain's and owners' quarters and crew's shower.

Electrical Equipment

The electrical installation consists of one 6 K. W. Holmes engine and dynamo, direct connected, placed on running deck engine room on port side of ship. The equipment consists of about 100 lights, with conduit installation throughout the holds and engine room, all to the requirements of the British Corporation. On deck there are eight positions for portable lights, for working cargo by night, also plugs located right forward and aft for convenience in taking draughts. Ample light is provided in the holds by means of four lamps at each cargo hatch, placed close to deck, well out of the way. The forward end is controlled by eight-circuit panel box, fitted in crew's hall, and the after end by another eight-circuit panel box located in stairway to engine room. Electric tell-tales fitted in pilot house to indicate when the navigation lights fail. Running lights and the telegraphs and binnacles are fitted for both oil and electric light. The whole installation has been carefully laid out to insure ample light in all rooms, and also to include the exterior of the deck houses and the machinery space.

Propelling Machinery

The main engine is vertical, triple-expansion, surface-condensing, having 16-in., 26-in. and 44-in. diameter of cylinders by 36 in. stroke with direct connected Edward's air pump, feed and bilge pump. The surface condenser is of cast iron, embodied with the back column in the design of the engine. There are two boilers 11 ft. 6 in. diameter by 10 ft. 6 in. long built for 180 lbs. working pressure and equipped with the Howden system of forced draft.

The auxiliary machinery in the engine room consists of one 9 in. by 10 in. by 10 in. duplex vertical circulating pump, one 9 in. by 10 in. by 10 in. duplex vertical ballast pump, one 8 in. by 4 in. by 10 in. horizontal duplex auxiliary feed and fire pump, one 4 in. by 4 in. by 5 in. horizontal duplex sanitary pump and one 6 K. W. generating set direct connected to vertical engine for the electric light service of the ship.

The owners were represented by Messrs. John Reid & Co., naval architects, of Montreal. The vessel will be sailed by Capt. J. J. Murray, late of steamer Keyport, with J. H. McMillan as chief engineer.

Lifting Trial of Medway Dock

The final lifting trial of the Dreadnought dock, built by Swan, Hunter & Wigham Richardson, Ltd., Wallsend-on-Tyne, for the British admiralty, took place in the River Medway on Oct. 2, when the British battle-cruiser Lion, displacing 30,415 tons and drawing 31 ft. 6 in. of water was successfully docked and lifted. The actual lifting operation of the dock from a draught of 31 ft. 6 in. until the pontoon deck was awash at the sides occupied three hours and ten minutes. The total distance through which the vessel was lifted was 36 ft. and the total quantity of water necessary to be pumped in order to raise the deck of the dock clear of the water was about 46,000 tons. After the vessel had been cleaned and painted and some necessary repairs had been effected, the dock was lowered the following morning at 8 o'clock and the ship was undocked during the day. The operation of lifting this huge battle-cruiser was one of the greatest interest, as no ship of similar displacement has ever been lifted out of the water by a floating dock. The time occupied in lifting the vessel was well within the limits prescribed by contract.

The Seattle Construction & Dry Dock Co. is building from plans by Cox & Stevens, naval architects, of New York, an ocean-going steam yacht surpassing in size any similar craft now in Pacific waters, for D. C. Jackling, of Salt Lake City. The vessel will be constructed of steel and will be finished throughout with teak and mahogany. The yacht will be of the following dimensions: Length over all, 212 ft.; length at water line, 205 ft.; breadth, extreme, 27 ft.; breadth at deck, 26 ft. 6 in.; depth, molded, about 15 ft. 6 in. The vessel will be equipped with two 4-cylinder triple-expansion engines, supplied with steam by Babcock & Wilcox water-tube boilers.

Bids for the construction of the six torpedo boat destroyers for the United States navy, which were to have been opened on Oct. 31, will be held up until Nov. 18, pending a careful study of the opinion of the attorney general and the eight-hour law as applied to the construction of material for use in naval vessels.

Time Keeping by Machinery

by J. H. K. Shannahan Jr.

THE question of keeping an accurate and trustworthy record of the time made by employes has always been a difficult one to solve satisfactorily. The larger the number of men involved the greater has been the problem. It is not only a case of getting an accurate record of the actual time each man has made as the basis for his pay, but the distribution of his wages to the proper charge account. This has always been a troublesome matter and involving much detail work with a larger array of clerks than the manufacturer cares to see around.

Various methods for keeping time have been tried. The one most common is that of the time-keeper who makes regular trips about the works and from his own observation and from information furnished by the various foremen, obtains the number of hours made by each man. This is unsatisfactory and is frequently inaccurate, besides, there is abundant room for a time-keeper and a foreman, if they are dishonest, to pad the rolls.

All of these problems seem to have been most successfully dealt with by the marine department of the Maryland Steel Co., at Sparrows Point. In this department alone, there are over 2,000 men employed, hence any system which they have developed may be safely assumed to be thoroughly practicable.

A bold step was taken by virtually making each man his own time-keeper. This was made possible by the introduction of a card system operated in conjunction with time clocks. At the entrance to the yard are the clock houses, and the only entrance and exit for the yard is through these houses. To better handle the large number of men there are eight houses, over the doors of each of which is a sign showing the range of numbers whose holders will use that entrance or exit.

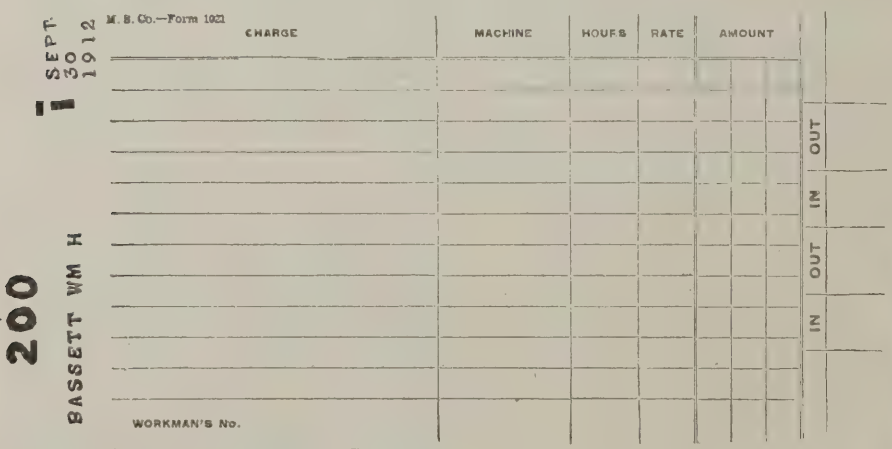
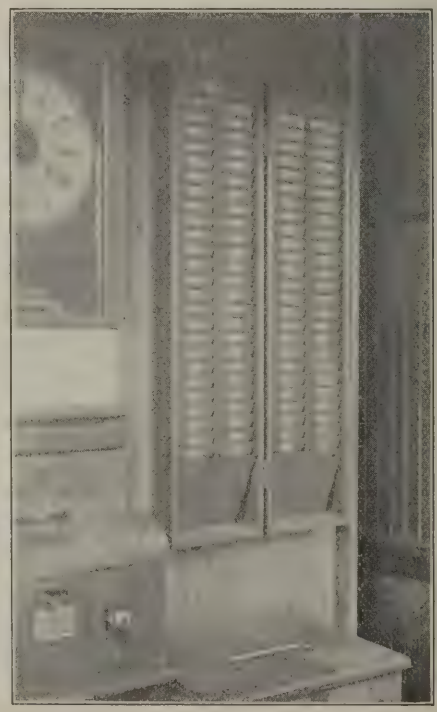


FIG. 1—DAILY CLOCK CARD AND THE BASIS OF ALL OPERATIONS

On one side of the narrow hallway there is a clock and the card rack. The most obtuse foreign laborer knows his working number, for he thoroughly understands that without it he cannot receive his pay envelope. As his card is always in the same place in the rack and bears his working number in large figures as well as his name, it is but a second's work for him upon going to work in the morning to take his card from the rack, insert it in the clock and place it back properly in the rack.

A word about the card used. This is reproduced in Fig. 1. As will be



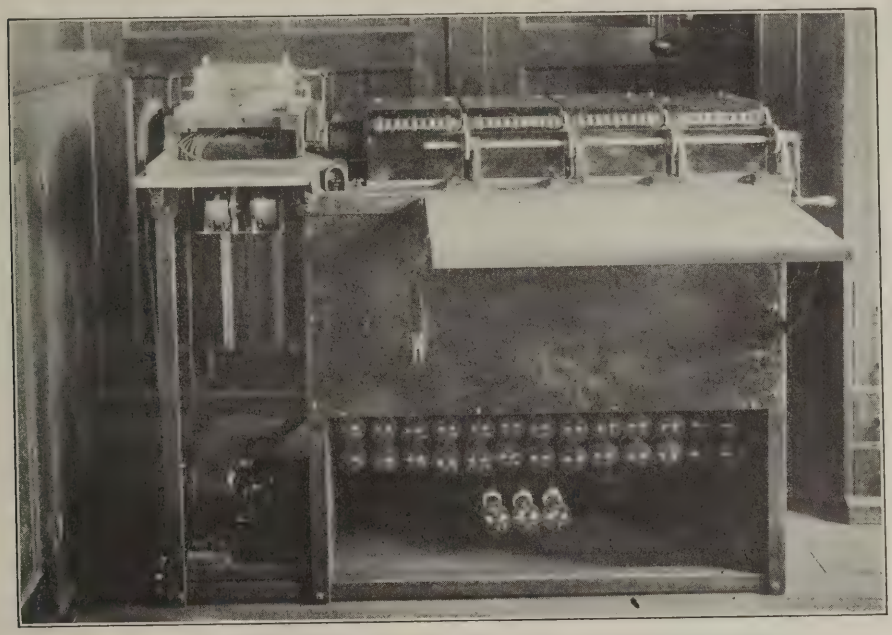
TIME CLOCK AND CARD RACK

The Maryland Steel Company Pay Roll Week Ending

NAMES OF EMPLOYEES	S	M	T	W	T	F	S	Hours	Wages	Store	Rent	Doctor	B A	Cash	Balance

FIG. 2—TOP OF PAY ROLL SHEET, SHOWING ARRANGEMENT

observed, a new card is used each day. At first weekly cards were tried, a single card being used by a workman for a whole week, but for reasons which are apparent and which will be enlarged upon later on, this was found unsatisfactory and a daily card substituted. After several year's trial, the daily card has been pronounced a complete success.



ELECTRICALLY-DRIVEN ARITHMETICAL MACHINE WHICH ADDS VALUES OF CARDS FED INTO IT

The clock stamps the time of reporting for work and of quitting, in the spaces marked "In" and "Out." When the workman goes to work in the morning he finds a new card in the rack bearing his name, number and the date. He works it in the clock and places it back in the rack. When he goes out at the noon hour, the operation is repeated, likewise upon his return and upon leaving the yard in the evening, four operations in all.

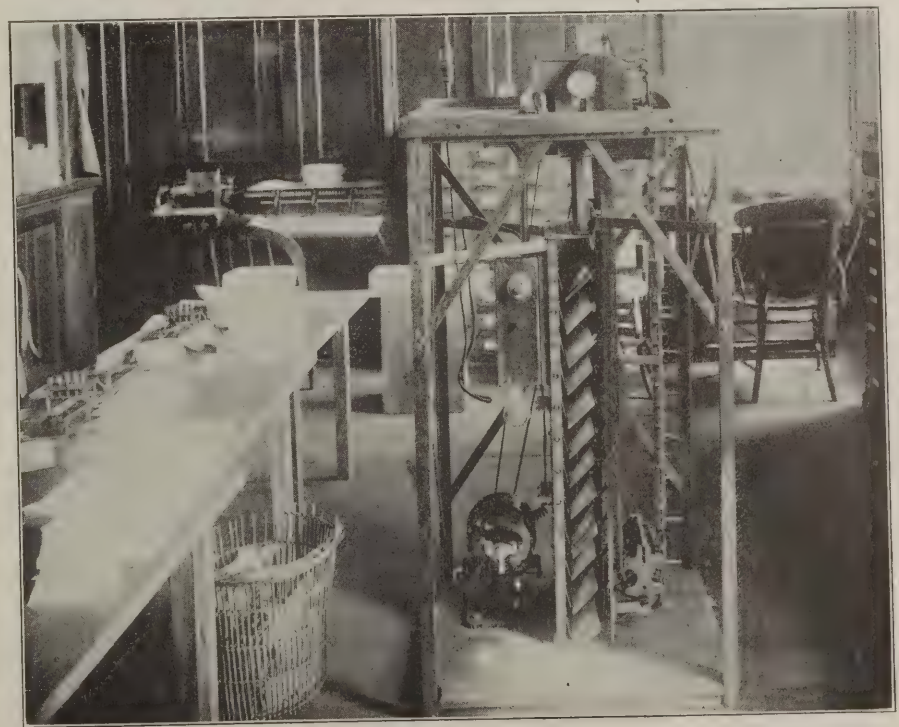
After the day's work, the card is collected and turned over to the accounting department for entry upon the pay roll and for distribution. *Thus every day's time is distributed the following day.* We will treat of this point, though, a little more in detail later on.

So far as the time made is concerned, employer and workman both feel entirely satisfied that the record shown by the card is absolutely correct.

Before taking up the very interesting question of the distribution of the amounts on the cards, it may be well to tell something of the preparation of the pay rolls from data taken from the cards.

The paymaster has his pay roll sheets, Fig. 2, on which are *printed* the names of the men and their working numbers. This work is done by an ingenious little machine, run by an electric motor, using an endless chain, each link of which is detachable and bears the name and number of one man. The detachable feature provides for the dropping of a name if a man for any reason is no longer employed. The same chains used for printing the rolls are likewise used to print the names upon the pay envelopes. After the names have been written up on the rolls, the sheets serve for a week and as each day's cards come in, the hours are transcribed to the rolls, as well as the rate. It is therefore, at the end of the week, a very simple problem of arithmetic to arrive at the total earnings for each man. The whole operation, it will be observed, is upon data which the workman has himself kept and furnished.

This disposes of that part of the system having to do with the timekeeping and we may now properly take up its distribution. It is surprising, even in this age, the extent to which purely mechanical devices are being introduced into clerical



ELECTRICALLY DRIVEN CARD SORTER, SHOWING THE BINS IN THE FOREGROUND INTO WHICH CARDS ARE AUTOMATICALLY PLACED

MATERIAL CARDS

1 3 5 7 9 11 / 2 4 6 8 10 12	Mater'l class.	Code.	Cl's.	Hull.	Charge.	Unit.	Quantity.	Value.	
						Gl.			CT
						Hr			L
0 0	0 0	0 0 0	0	0 0	0 0 0 0 0	0 0	0 0 0 0 0 0	0 0 0 0 0 0 0	
1 1	1 1	1 1 1	1	1 1	1 1 1 1 1	Lb 1 1	1 1 1 1 1 1	1 1 1 1 1 1 1	
2 2	2 2	2 2 2	2	2 2	2 2 2 2 2	Tn 2 2	2 2 2 2 2 2	2 2 2 2 2 2 2	
3 3	3 3	3 3 3	3	3 3	3 3 3 3 3	Ft 3 3	3 3 3 3 3 3	3 3 3 3 3 3 3	
1 4	4 4	4 4 4	4	4 4	4 4 4 4 4	Pc 4 4	4 4 4 4 4 .	4 4 4 4 4 4 4	V
2 5	5 5	5 5 5	5	5 5	5 5 5 5 5	Dz 5 5	5 5 5 5 5 .	5 5 5 5 5 5 5	F
3 6	6 6	6 6 6	6	6 6	6 6 6 6 6	Gr 6 6	6 6 6 6 6 .	6 6 6 6 6 6 6	S
4 7	7 7	7 7 7	7	7 7	7 7 7 7 7	Bg 7 7	7 7 7 7 7 .	7 7 7 7 7 7 7	IC
5 8	8 8	8 8 8	8	8 8	8 8 8 8 8	Bu 8 8	8 8 8 8 8 .	8 8 8 8 8 8 8	BC
+ 9	9 9	9 9 9	9	9 9	9 9 9 9 9	Bbl 9 9	9 9 9 9 9 .	9 9 9 9 9 9 9	

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FIG. 3—BEFORE PUNCHING

MATERIAL CARDS

1 3 5 7 9 11 / 2 4 6 8 10 12	Mater'l class.	Code.	Cl's.	Hull.	Charge.	Unit.	Quantity.	Value.	
						Gl.			CT
						Hr			L
0 0	0 0	0 0 0	0	0 0	0 0 0 0 0	0 0	0 0 0 0 0 0	0 0 0 0 0 0 0	
1 1	1 1	1 0 1	1	1 1	0 0 1 1 1	Lb 0 1 1	1 1 1 1 1 1	1 1 1 0 1 1 1	
2 2	2 2	2 2 2	2	0 2	2 2 2 2 2	Tn 2 2	0 2 2 2 0 2	2 2 2 2 0 2 2	
3 3	3 3	3 3 3	3	3 3	3 3 3 3 3	Ft 3 3	3 3 3 3 3 3	3 3 3 3 3 3 0	
1 4	4 4	4 4 4	4	4 4	4 4 4 4 4	Pc 4 4	4 4 4 4 4 .	4 4 0 4 4 4 4 0	V
2 5	5 5	5 5 5	5	5 5	5 5 5 5 5	Dz 5 5	5 5 0 5 5 .	5 5 5 5 0 5 5	F
3 6	6 6	6 6 6	6	6 0	6 6 0 6 6	Gr 6 6	6 6 6 6 6 .	6 6 6 6 6 6 6	S
4 7	7 7	7 7 7	7	7 7	7 7 7 7 7	Bg 7 7	7 0 7 7 7 .	7 7 7 7 7 7 7	IC
5 8	8 8	8 8 8	8	8 8	8 8 8 8 8	Bu 8 8	8 8 8 8 8 .	8 8 8 8 8 8 8	BC
+ 9	0 9	9 9 0	9	9 9	9 9 9 9 9	Bbl 9 9	9 9 9 9 9 .	9 9 9 9 9 9 9	

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FIG. 3—AFTER PUNCHING

etc. The principle of the thing is simplicity itself. As stated before, the machine is electrically operated. The brush which passes over the face of the card comes in contact with the metallic roller back of the card, through the small hole. This forms an electrical contact and operates the slide for that particular bin. Hence all cards punched for the class to which the sorting machine is adjusted, will be thrown together. They may then be passed over to the adding machine and their total values determined.

The same method is employed for the distribution of material used. This card is red in color and is shown in Fig. 4. The data is punched out from information furnished by foremen and the store houses, and the sorting and adding machines perform the same functions for them as for the time cards.

To sum up, the system has unfailing accuracy of the actual time to which each men is entitled, no padded rolls is possible, and with the mechanical devices used, the distribution of the time and material is accomplished with great rapidity and carries with it the assurance that the human agency and its attending tendency to err is reduced to a minimum.

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work. Arithmetical machines which will add, multiply, divide and subtract have been on the market for some years and reasonably familiar to all. But here we come to a machine, electrically driven, which will take several hundred or several thousand cards, and separate them automatically into whatever divisions the operator may elect. Standing alongside is another electrically operated machine which will take any given group of cards and by feeding them into it, will add their values with great rapidity and absolute accuracy. It is thus possible to distribute the time of 2,000 men within a few hours, whereas by the old methods it would require a half dozen clerks several days.

But a little more in detail. When the clock card shown in Fig. 1 comes into the accounting repartment, a girl will take the card shown in Fig. 3 and will transcribe the data on No. 1 to No. 3 by punching out the corresponding information. Card No. 3 then forms the basis of operation for the distribution. When all the cards are ready, or any part of them, for that matter, they may be sorted. The sorting machine can be adjusted to sort for any one of the several classes; man's number, operation number, class, hull, charge, machine,

MATERIAL CARDS

1 3 5 7 9 11 / 2 4 6 8 10 12	Mater'l class.	Code.	Cl's.	Hull.	Charge.	Unit.	Quantity.	Value.	
						Gl.			CT
						Hr			L
0 0	0 0	0 0 0	0	0 0	0 0 0 0 0	0 0	0 0 0 0 0 0	0 0 0 0 0 0 0	
1 1	1 1	1 1 1	1	1 1	1 1 1 1 1	Lb 1 1	1 1 1 1 1 1	1 1 1 1 1 1 1	
2 2	2 2	2 2 2	2	2 2	2 2 2 2 2	Tn 2 2	2 2 2 2 2 2	2 2 2 2 2 2 2	
3 3	3 3	3 3 3	3	3 3	3 3 3 3 3	Ft 3 3	3 3 3 3 3 3	3 3 3 3 3 3 3	
1 4	4 4	4 4 4	4	4 4	4 4 4 4 4	Pc 4 4	4 4 4 4 4 .	4 4 4 4 4 4 4	V
2 5	5 5	5 5 5	5	5 5	5 5 5 5 5	Dz 5 5	5 5 5 5 5 .	5 5 5 5 5 5 5	F
3 6	6 6	6 6 6	6	6 6	6 6 6 6 6	Gr 6 6	6 6 6 6 6 .	6 6 6 6 6 6 6	S
4 7	7 7	7 7 7	7	7 7	7 7 7 7 7	Bg 7 7	7 7 7 7 7 .	7 7 7 7 7 7 7	IC
5 8	8 8	8 8 8	8	8 8	8 8 8 8 8	Bu 8 8	8 8 8 8 8 .	8 8 8 8 8 8 8	BC
+ 9	9 9	9 9 9	9	9 9	9 9 9 9 9	Bbl 9 9	9 9 9 9 9 .	9 9 9 9 9 9 9	

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FIG. 4—BEFORE PUNCHING

MATERIAL CARDS

1 3 5 7 9 11 / 2 4 6 8 10 12	Mater'l class.	Code.	Cl's.	Hull.	Charge.	Unit.	Quantity.	Value.	
						Gl.			CT
						Hr			L
0 0	0 0	0 0 0	0	0 0	0 0 0 0 0	0 0	0 0 0 0 0 0	0 0 0 0 0 0 0	
1 1	1 1	1 0 1	1	1 1	0 0 1 1 1	Lb 0 1 1	1 1 1 1 1 1	1 1 1 0 1 1 1	
2 2	2 2	2 2 2	2	0 2	2 2 2 2 2	Tn 2 2	0 2 2 2 0 2	2 2 2 2 0 2 2	
3 3	3 3	3 3 3	3	3 3	3 3 3 3 3	Ft 3 3	3 3 3 3 3 3	3 3 3 3 3 3 0	
1 4	4 4	4 4 4	4	4 4	4 4 4 4 4	Pc 4 4	4 4 4 4 4 .	4 4 0 4 4 4 4 0	V
2 5	5 5	5 5 5	5	5 5	5 5 5 5 5	Dz 5 5	5 5 0 5 5 .	5 5 5 5 0 5 5	F
3 6	6 6	6 6 6	6	6 0	6 6 0 6 6	Gr 6 6	6 6 6 6 6 .	6 6 6 6 6 6 6	S
4 7	7 7	7 7 7	7	7 7	7 7 7 7 7	Bg 7 7	7 0 7 7 7 .	7 7 7 7 7 7 7	IC
5 8	8 8	8 8 8	8	8 8	8 8 8 8 8	Bu 8 8	8 8 8 8 8 .	8 8 8 8 8 8 8	BC
+ 9	0 9	9 9 0	9	9 9	9 9 9 9 9	Bbl 9 9	9 9 9 9 9 .	9 9 9 9 9 9 9	

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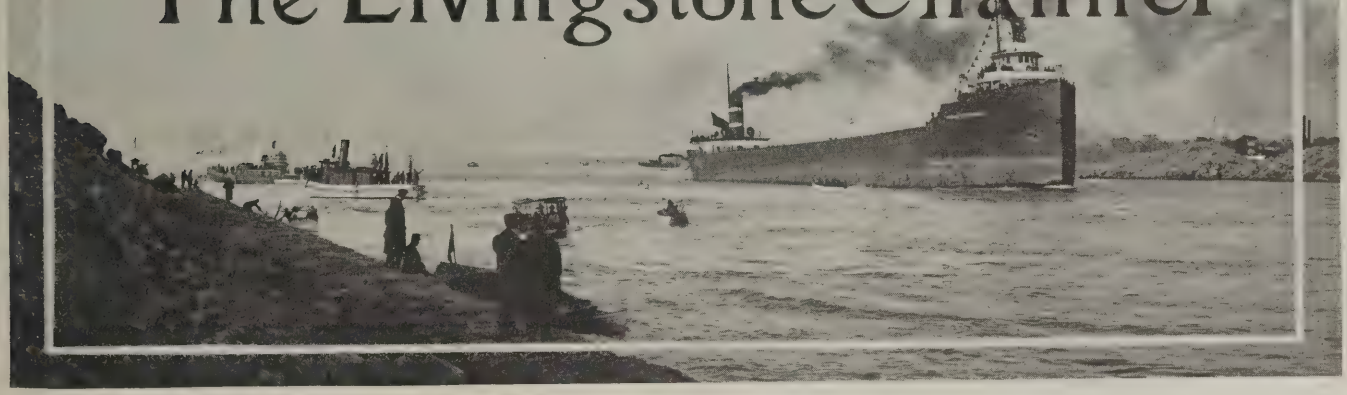
FIG. 4—AFTER PUNCHING

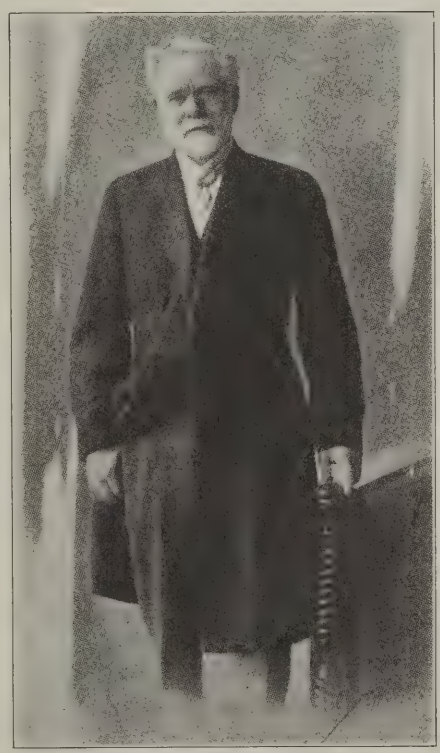
Bulk Freighter Wm. Livingstone opening The Livingstone Channel



THE Livingstone channel at the mouth of the Detroit river, was opened to commerce on Saturday, Oct. 19, with imposing ceremonies. The channel passes to the westward of Bois Blanc Island, making an independent waterway for downbound vessels and eliminating altogether the necessity of passing over the Limekiln crossing. The improvement has been long desired, as the Limekilns mark the most congested bit of waterway on the lakes, and an extremely dangerous place to navigation, owing to the restricted channel, rocky bottom and swift current. This channel was conceived by William Livingstone, president of the Lake Carriers' Association, who spent a great deal of time interesting the government engineers in the work and in prevailing upon congress to appropriate the necessary funds to construct it.

Work upon the channel was begun in the spring of 1908, and was concluded early in October of the present year. The channel altogether is about 11 miles long, though for a considerable part of its length little or no dredging was necessary. The important part of the work was the deepening of the channel abreast of Stony Island, where the natural depth of the river was only five or six ft. It was estimated that it would cost about 50 per cent less to dredge this portion of the channel in the dry and therefore the river was cofferdammed at that point. Work then proceeded without interruption for a period of four years.

The bulk freighter William Livingstone, owned by G. A. Tomlinson, of Duluth, was selected to open the channel under the pilotage of President Livingstone. Arrangements had been made to have all down-bound vessels that reached the St. Clair lightship by eight o'clock Saturday morning anchor until one o'clock, when the Livingstone, which was moored at the Brush street wharf in the Detroit river, would start down the river.



WILLIAM LIVINGSTONE

The flotilla of bulk freighters which had anchored near the St. Clair lightship under the general supervision of Capt. J. M. Johnston, shore superintendent of the Cleveland-Cliffs Iron Co., also began to make its appearance around the head of Belle Isle shortly after one o'clock, and the Livingstone then threw off her mooring lines and began her journey. She was followed immediately by the excursion steamer Britannia, carrying about 2,000 persons, and then came the fleet of bulk freighters and other available craft. The Livingstone's progress down the river was in the nature of a triumph. Everything that had steam up saluted her to the end that her own whistle was rarely silent. She entered the Livingstone channel at 3:15 p. m. and rounded the Bar Point lightship at 4:30, where President Livingstone was transferred to the Britannia, which had on board the members of the Detroit Board of Commerce. They were addressed by President Livingstone and responses were made by Homer Warren, president of the board of commerce; Mayor W. B. Thompson and Congressman McMorran. Those on board the Livingstone to do honor to the occasion were H. Coulby, president of the Pittsburgh Steamship Co.; J. H. Sheadle, secretary of the Cleveland-Cliffs Iron Co.; J. S. Ashley, of M. A. Hanna & Co.; Capt. John Mitchell, Capt. C. L. Hutchinson, S. P. Shane, A. R. Rumsey; C. B. Calder, general manager of the Toledo Ship Building Co.; R. B. Wallace, general manager of the American Ship Building Co.; Frank Jeffrey, general manager of the Detroit Ship Building Co., and a few invited guests.

The Lake Carriers Association ten-

EXCAVATED AREA OF THE LIVINGSTONE CHANNEL

dered a complimentary dinner to President Livingstone at Hotel Pontchartrain on Saturday night, at which J. H. Sheadle, vice president of the association, presided as toastmaster. In presenting Mr. Livingstone, he said that no man had done so much for the waterways of the great lakes. Mr. Livingstone in response said that when he first became associated with lake trade, 97 per cent of the tonnage was sail and 3 per cent steam. Today 96 per cent is steam and 4 per cent sail, including as sail the barges which are towed. He referred to the well-known fact that the Poe lock, though adequate for a great many years, was practically inadequate before it was completed, so rapid has been the expansion of commerce.

Mr. Coulby said that his life had been devoted to water transportation, and that it is a science upon which the welfare of the whole people depends. If barriers are removed it is not for the benefit of the vessel owner or the farmer, but for humanity in general. He did not number himself among those who look back with longing at $2.00 freights. That period belongs to the past. The benefit of deeper channels is only momentary to the ship. It takes away the barrier between producer and consumer, and the consumer gets the benefit. Ten years ago the straight cut at the mouth of the Detroit river was a dream; today it is a reality and an eternal monument to the man who conceived it.

Col. C. McD. Townsend said that the 80,000,000 tons of freight which annually pass through the Detroit river justifies the great expense of the Livingstone channel. He referred to the fact that it costs 4 cents per ton mile to move freight on the Mississippi between St. Louis and Cairo, whereas on the great lakes it is moved for eight-tenths of a cent per ton mile.

Col. Patrick, government engineer with headquarters at Detroit, said that the saving of one cent a ton on the commerce passing through the Detroit river would pay for the Livingstone channel in ten years.

Addresses were also made by Geo. H. Russel, George H. Barbour, Homer Warren, G. A. Tomlinson, Chief Justice Joseph P. Moore, of Michigan, and Capt. D. Sullivan. Especially interesting were the remarks of Capt. D. Sullivan, who contrasted early conditions on the lakes with present practice. Owing to the historical importance of his remarks, they are incorporated herewith:

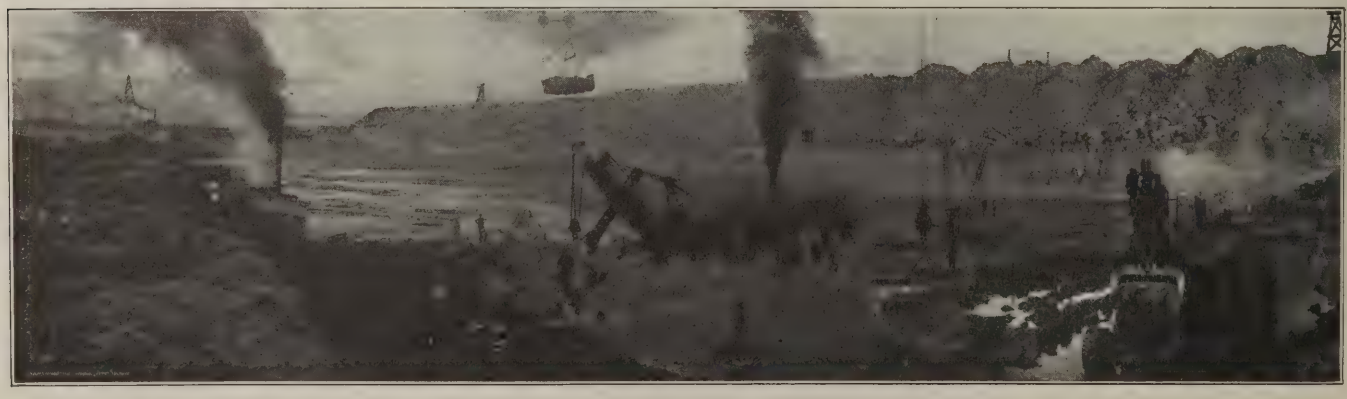
Remarks of Capt. D. Sullivan

"Mr. Livingstone and his associates in the Lake Carriers' Association with assistance in the way of liberal appropriations from the federal government, and the most earnest and hearty support of that grand body of men, the government engineers, have made history in improving lake channels the past ten years that will stand for all time.

"Mr. Sheadle informed me that I am expected to take the place of ox tail soup on his card, that is, I am expected to go back a long way in lake affairs. I don't know why he did not call upon Capt. John Mitchell or some of the older sailors present, unless he wanted to show me up because my good wife is present. However, I will start in, simply noting a few of the changes in lake marine since 1863. In that year, I sailed in a ship of 160 tons capacity in the coal trade between Erie and Buffalo. She was owned and sailed by a gentleman who now resides in Michigan, and is recognized as one of her wealthy citizens.

"We had plenty of good food, also plenty of fresh air and exercise. I don't recall now what wages were promised us. I don't think that made much difference. There wasn't much money in circulation then. If there was, it didn't reach us; however, we were happy and satisfied for we realized that we were receiving a good practical education, not only in seamanship, but also in economy.

"In looking back it seems to me



LIVINGSTONE CHANNEL, SHOWING THE WALL-LIKE CONSTRUCTION

that with the passing of the sailing ship on the lakes, the romance and the greater part of the sentiment passed with them. In recalling the names of some of the handsomest vessels that ever floated in any waters there were the Coquette, Wend the Wave, Wings of the Morning, Starlight, Sunrise, Morning Light, Moonlight, Sunnyside, Sweetheart.

"The ships of today are named for men who do things. That's why that monster that headed the procession today was named the William Livingstone. It's a fitting name for her. Nobody would think of naming her sweetheart. It would be very appropriate for the man,—but not the ship.

"Another marked change is the sinking of the personality of the old-time master. The vessel he sailed was seldom referred to by his associates or men directly connected with marine affairs. If you asked the mate on relieving him what vessels he met during his watch he would answer John Lowe, Jim Brown, Jack Shaw, Johnnie Coulter, George McLeod, Jimmie Rardon, Jerry Coleman, as the case might be.

"There is one body of men who figured largely in the lake trade that I take off my hat to, and those were the men who were masters of the finest tugs that ever turned a wheel in the sixties and seventies. Their skill in navigating the rivers and unmarked channels with a string of vessels, was simply marvelous, and was only surpassed by the skill displayed by the gentlemen who organized the Detroit River Towing Association in separating the unfortunate vessel man from his money.

"I would very much like to have a copy of their tariff of 1872. I think they must have had the assistance of a plumber in getting it up. The distance from Lake Erie to the flats is about 50 miles. The tariff stated that if a vessel sailed from Lake Erie up to that point that she would be towed the other 30 miles at the full tariff rate from Lake Erie to Lake Huron, and the same if a vessel sailed down from Lake Huron to the flats.

"Grassy Island and Mamajuda were the only aids to navigate between Bobolo and Wind Mill Point.

Beginning of Private Lights

"In 1873 some enterprising gentleman placed a float on Ballard's reef which displayed a red light that could be seen under favorable weather conditions about 500 ft. Collections were taken from the vessels. As this showed a good profit, several enterprising citizens hung up a lamp at intervals all the way up to Fort Gratiot and the good work of collecting went on until Mr. Livingstone prevailed on the government to forbid the use of private lights.

As late as 1880 there was no official gage at the Lime Kiln Crossing. Duff & Gatfield displayed a red flag from a pole on the dock when the water looked low. On making inquiry about the probable depth you were told that Johnnie Coulter struck going over yesterday, or George McLeod struck this afternoon, but not quite so hard, and there you were. If you wanted to take a chance, there was always a small tug to assist you in making the attempt.

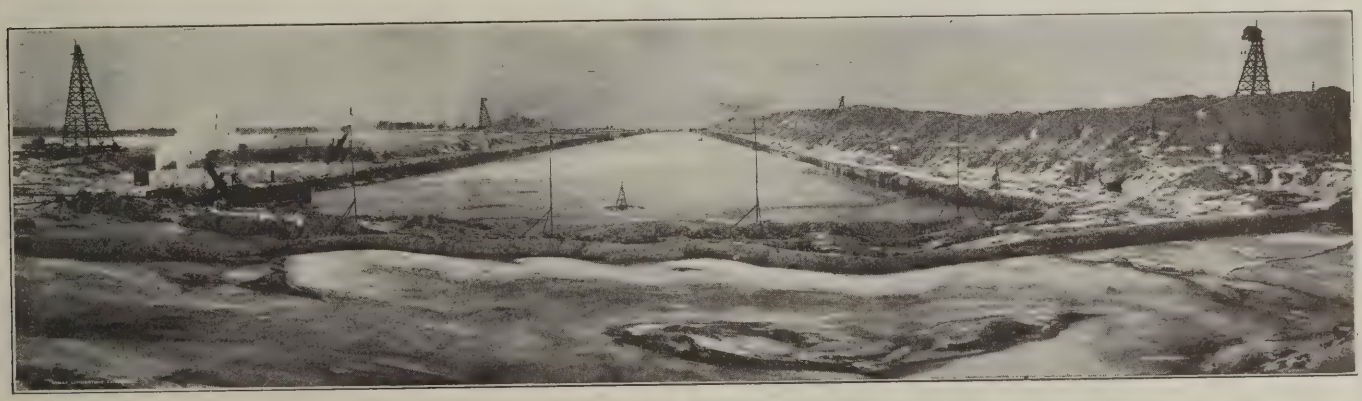
Coming of the Steel Ship

"Detroit was the one point on the voyage in the sixties and early seventies that no vessel could get by without making a call at the marine post office, located at Trowbridge & Wilcox's store. Anything in the way of ship supplies from a needle to an anchor could be obtained there, and a tow stopping at Detroit at six in the evening seldom got away until six in the morning. This was all changed by the advent of the large sailing fleet in the early seventies, the masters as a rule making a contract with the tug to go through without stopping unnecessarily, which could be done, as coal was rapidly displacing wood.

"The next decade brought the steel ship, and the passing of the white wings was rapid. Beautiful, neat, trim sailing vessels were degraded into tow barges. It almost broke my heart to suddenly come on to what was once a fine ship in the harbor of Cleveland one day in 1890. I commanded her for 12 years, and they were 12 of the happiest years of my life. O! what a change; her foremast was leaning to port, her main mast was starboard, and her mizzen mast head gone at the trustle trees. She was loaded all right; she had about two inches of free board amidship.

"Good old days. We frequently hear of the good old days. That is a mistaken idea. If there were 'good old days' it was only for some boy whose father was in a position to send to college. There was no 'good old days' for the sailor boy. The crews as a rule handled the cargo at one end of the trip and lumber and other coarse freight were loaded off shore, or from lake shore piers. The hours were continuous in some instances, and 17 or 18 working hours in most all cases in loading ports.

"The crew's quarters in the handsomest vessels were dungeons in comparison with the quarters on the modern steel ship. Everything in the so-called 'good old days' on board ship was done by main strength and hand labor. The watch below was subject to call at any minute to take in or shorten sail. The watches were then four hours. The watches now are six hours, and the watch below are never called except to get up and eat. The men themselves on the modern ship know that the present are the good days, and that they are the best fed and best housed and best paid men that ever followed their line of work in any waters, and with the best opportunity for promotion if they make good."



LIVINGSTONE CHANNEL, ADMITTING WATER INTO THE PART THAT WAS EXCAVATED IN THE DRY

The New Buffalo Steamer

"See-and-Bee"

THE new side-wheel passenger steamer building for the Cleveland & Buffalo Transit Co., Cleveland, was launched on Nov. 9 from the Wyandotte yard of the Detroit Ship Building Co., and was christened See-and-Bee by Miss Eleanor Moodey, daughter of Robert C. Moodey, of Painesville, a director of the company, thousands witnessing the event. The new steamer is not only the largest sidewheel passenger steamer on the great lakes, but is also the largest sidewheeler in the world, and it is not likely that a steamer of her type exceeding her dimensions will ever be built. Naval architects are quite agreed that she is the last word for this class of craft. Frank E. Kirby is reported to have said that he will never design a bigger sidewheeler.

The steamer is of the following dimensions:

Length over all	500 ft.
Length between perpendiculars	485 ft.
Beam of hull, moulded	58 ft.
Extreme beam over guards	97 ft. 8 in.
Depth of hull at stem	30 ft. 4 in.
Depth of hull at stern	27 ft. 1 in.
Depth of hull, moulded	23 ft. 6 in.
Depth of hull at guards	22 ft. 10 in.

Her guaranteed speed is 22 miles an hour from dock to dock.

There are 62 staterooms fitted with private toilet connections, 408 regulation staterooms, and 24 parlors en suite with private bath and toilet, making a total of 494 rooms.

Structure of the Hull.

The hull is constructed entirely of steel, having a double bottom for water ballast extending for a length of about 365 ft., and having a depth of 3 ft. above the base line. This double bottom is divided at the center line by a fore and aft watertight girder, and is further subdivided by transverse bulkheads into 14 separate watertight compartments. The hull above the water bottom is divided by 11 athwartship watertight bulkheads extending from the keel to the main deck. These watertight bulkheads, with the exception of the collision bulkhead and other bulkheads that are required by law to be without openings, are fitted with watertight doors operated hydraulically from the engine room.

Including the tank top, there are seven decks in all, namely, the orlop deck, main deck, promenade deck, galley deck, upper deck and dome deck.

Steel is used to a greater extent in the structure of this ship than in any other of her type, being carried to the promenade deck. The housings on orlop and main decks and top sides to promenade deck are of steel. The top sides of promenade deck are finished with channel gutter, forming a landing for the promenade deck beams, which are of wood. The beams and under side of promenade deck, however, are sheathed with galvanized iron with heavy asbestos paper between the iron and wood. This, with the steel housings up to the promenade deck, makes the vessel practically fireproof. Moreover, the engine room, boiler room and galley, ventilators and inclosures are all of steel and extend from the main deck through the top of the dome. Fireproof doors are also fitted, extending from the main deck through all decks to the dome, dividing the vessel into three separate compartments. In fact, particular attention has been paid in the designing and construction of the vessel to fire protection and appliances for fire fighting.

In addition to the three great divisions, the boat is divided into 50 sections for fire alarm purposes, each section containing about eight staterooms, and by means of a very ingenious device of hollow wire with which each stateroom is equipped, any disturbance will be immediately registered upon an annunciator located in the engine room and in the captain's quarters. The risk of a serious fire aboard has been reduced to a minimum through precautionary measures. For instance, the crew's quarters are built of steel throughout, the cargo spaces are insulated with galvanized iron and asbestos wherever wood is used. Steel fire curtains are fitted in cargo spaces opposite engine room inclosures. Fire hydrants are located throughout the vessel, so spaced that 50-ft. length of hose connected at all times reaches every part of the vessel.

There is also a very complete automatic sprinkler system throughout the interior of the ship, covering all cargo holds, crew's spaces, hallways and cabins, smoking room, lounge room, and other service rooms of the ship. This system is controlled automatically by a special sprinkler pump located in the engine room. When the vessel is docked connections are also made whereby city protection for fire purposes can be immediately used.

There are two trimming tanks, each of about 52 tons capacity, located on

both port and starboard sides just aft of the wheel casings. These tanks can be either filled or emptied in from two to four minutes, thus making it possible to keep the vessel always on an even keel.

Bow Rudder

To facilitate quick handling in rivers and harbors, the steamer is fitted with a bow rudder, which is controlled by a steam steering engine located on the main deck forward and directly connected to rudder stock by chain and quadrant. The character of the service is such that the vessel has to navigate restricted in somewhat tortuous channels at both Buffalo and Cleveland, and the bow rudder makes her instantly responsive and manageable. The after rudder is controlled by a steam steering engine connected to quadrant by a chain. The Akers emergency steam steering gear is also provided should anything go wrong at any time with the after rudder.

The vessel is fitted with two stockless anchors of 6,500 lbs. each, with 185 fathoms of 2¼ in. steel chain cable. Anchors are stowed on sloping anchor beds forward, connected and operated by a 10 by 10 speed geared windlass.

The life saving appliances of the vessel will be in accordance with government requirements, there being 18 metallic lifeboats, all of special design, 14 of these having capacity for 40 persons each, two having capacity for 20 persons each, and two for 16 persons each. In addition, the vessel is equipped with the usual number of life rafts and life preservers as required by the United States steamboat inspection service.

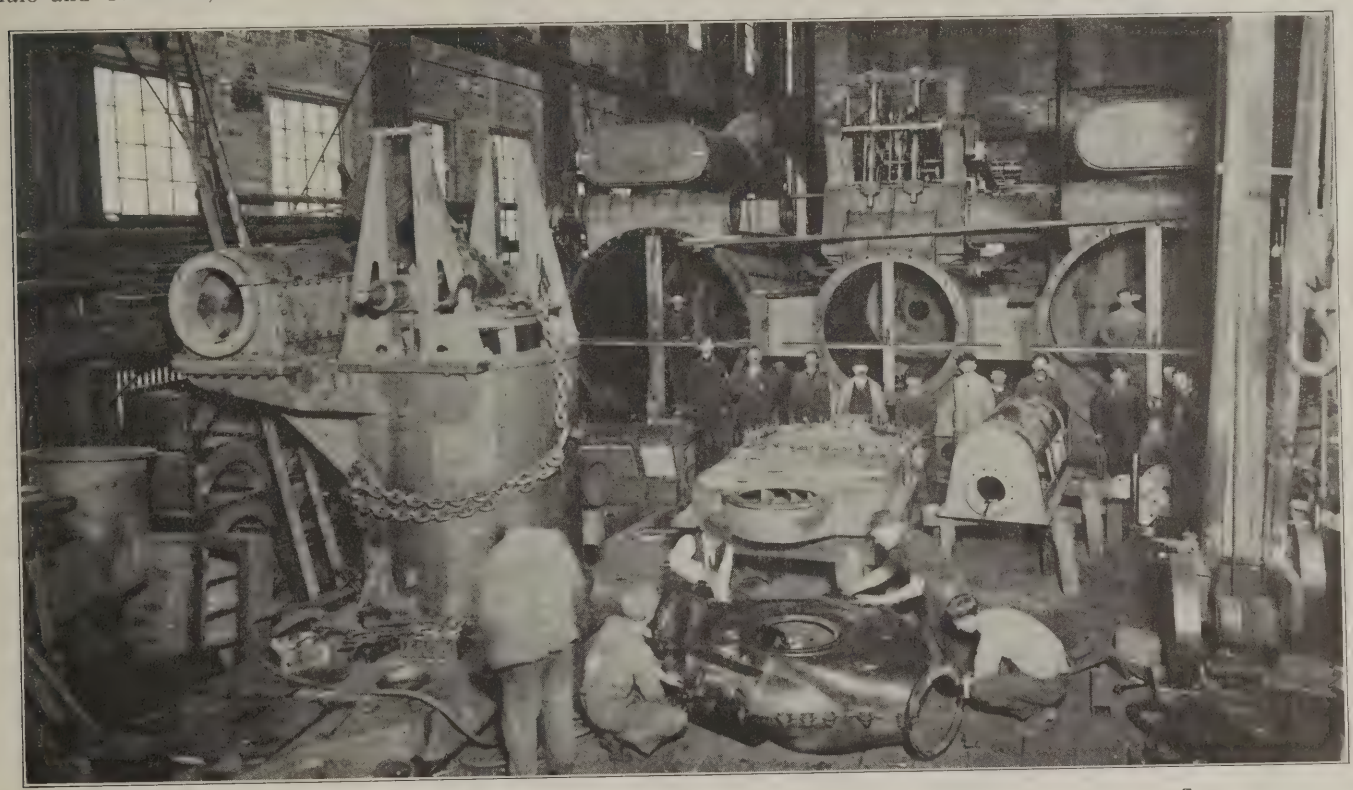
The second-class cabins, both for men and women, are built entirely of steel and are located on the main deck forward of the lobby.

Ventilation of the Ship

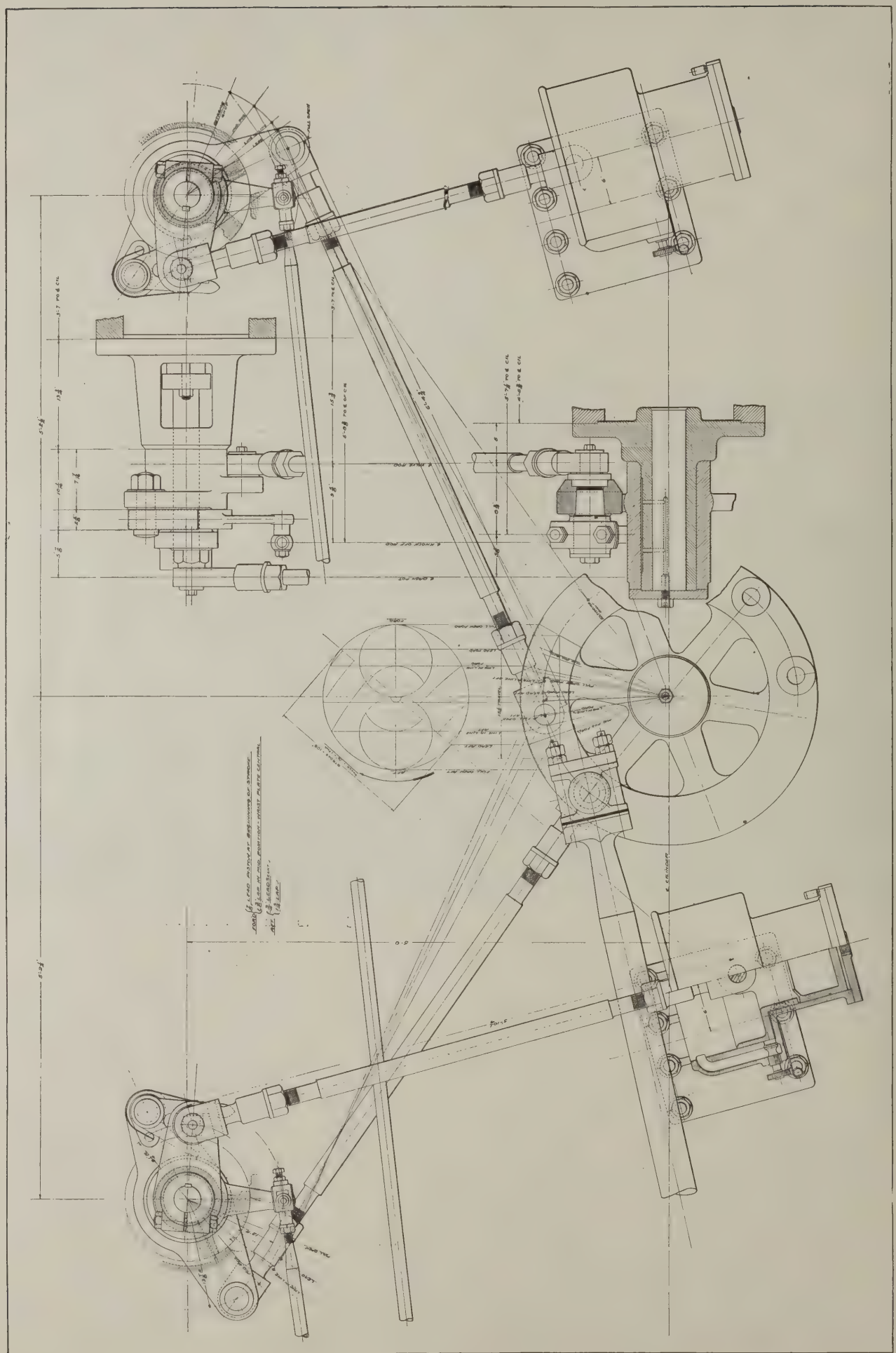
Great attention has been paid to the ventilation of the ship, which is equipped with the latest type of McCreery Engineering Co.'s washed air system of ventilation, reaching all inside staterooms, dining room, buffet, smokeroom, galley and crew's spaces. This system of ventilation is also directly connected to all lavatories and toilet rooms throughout the ship, and is divided into five units, as follows: One unit forward in the hold will supply the crew's quarters for that end of the ship; one unit in the hold directly aft of the engine room will supply the crew's quarters aft and the galley; one unit located on the orlop deck aft will supply the dining room, and two units on the main deck, port and starboard, will supply all the inside staterooms, the baggage room, the telephone room and second class deck cabins.

These units consist of a McCreery air washer, built of heavy sheet copper with brass angle and brass pipe work. A Sirocco fan direct connected to an electric motor draws the air through a washer and distributes it through the duct work. The spray in the washer is maintained by a centrifugal pump direct connected to an electric motor. Throughout the crew's quarters and galley adjustable elbows are used for distributing the air, making it possible to deliver the air in any desired direction. The air in the staterooms is introduced underneath the lower berths in such a manner and in such velocity that no draft is felt in any part of the room. The lower berth is kept out from the wall at least an inch so that the air flows directly upwards entirely around both berths. A space between two carlins is closed off and is provided with a hinged door at both the side wall of the inside staterooms and the outside of the cabins. This provides a natural exhaust to the rooms to the outside of the ship.

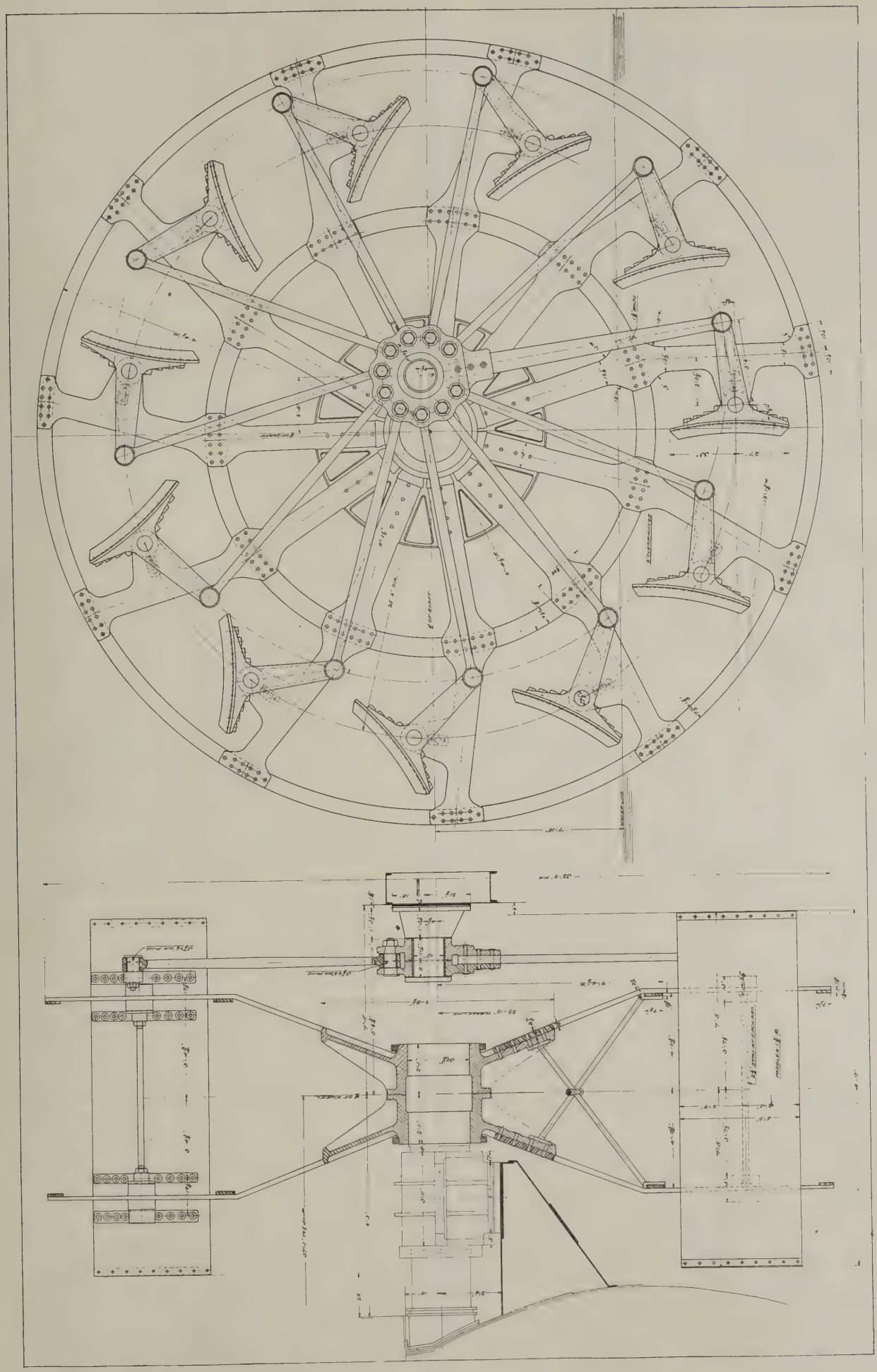
The heat generated in the galley and the foul air from the crew's quarters aft are removed by a large Sirocco fan located in the galley vent and connected to the spaces to be ventilated by means of duct work. Approximately 60 H. P. electric current is used for the ventilating system. The local vents from all the toilet fixtures throughout the ship are connected by means of duct work with aspirating tubes in two of the stacks, thus maintaining a positive exhaust of considerable suction on all



MAIN ENGINE OF THE CLEVELAND & BUFFALO TRANSIT CO.'S NEW STEAMER SEE-AND-BEE IN THE MACHINE SHOP OF THE DETROIT SHIP BUILDING CO.



LOW PRESSURE VALVE SETTING OF THE CLEVELAND & BUFFALO TRANSIT CO.'S NEW STEAMER SEE-AND-BEE



ARRANGEMENT OF PADDLE WHEELS OF CLEVELAND & BUFFALO TRANSIT CO.'S NEW STEAMER SEE-AND-BEE

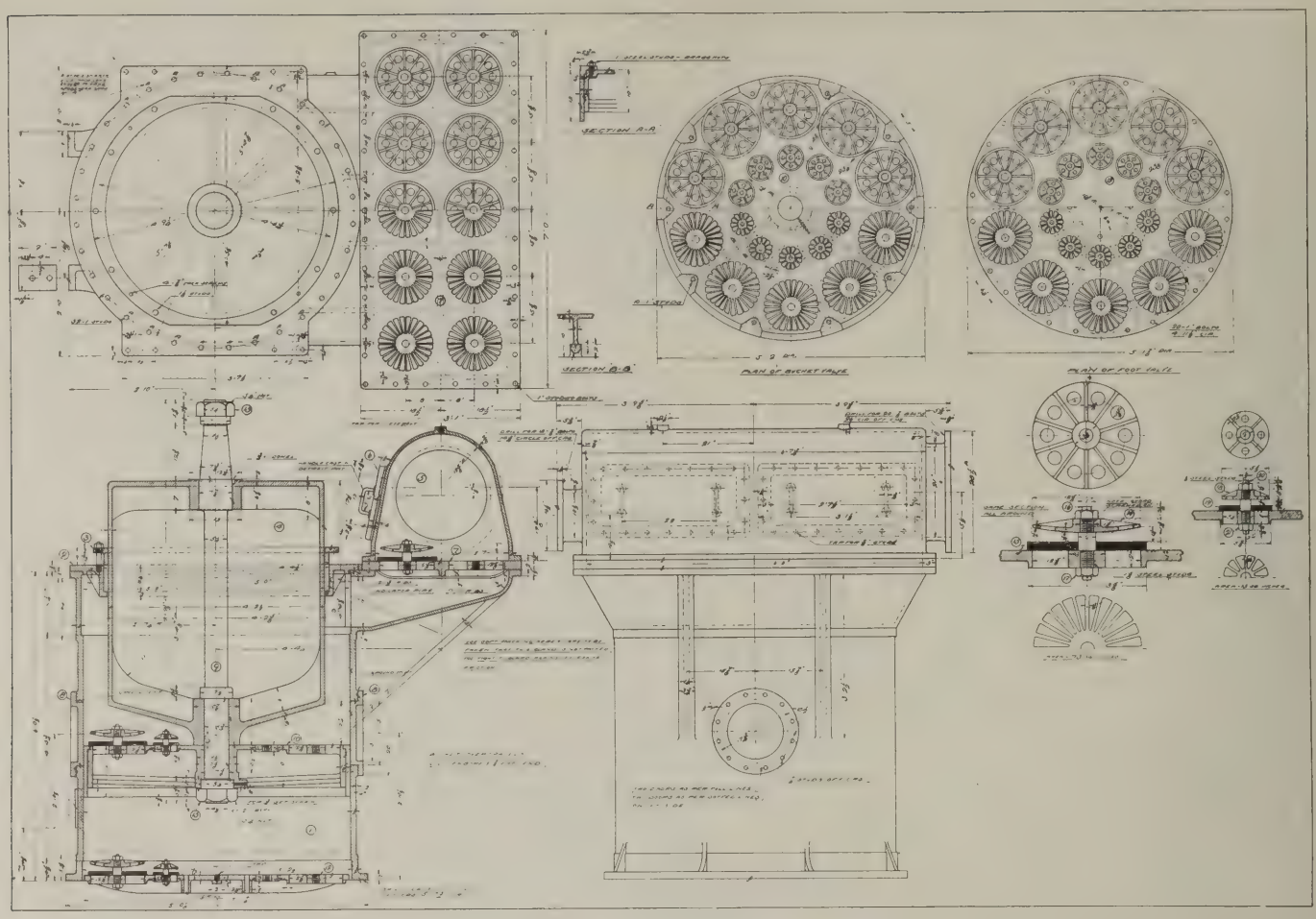


DIAGRAM OF AIR PUMPS OF THE CLEVELAND & BUFFALO TRANSIT CO.'S NEW STEAMER SEE-AND-BEE

these fixtures so that no possible odors escape into the ship. This is a very important feature, as a large number of toilet fixtures are installed with parlors and semi-parlors.

For warping the vessel at dock there are fitted on the main deck six 8 by 10 special mooring engines.

The steamer is also fitted with an Akers emergency steam steerer, which can be thrown into service in four seconds should the regular give out.

The Power Plant

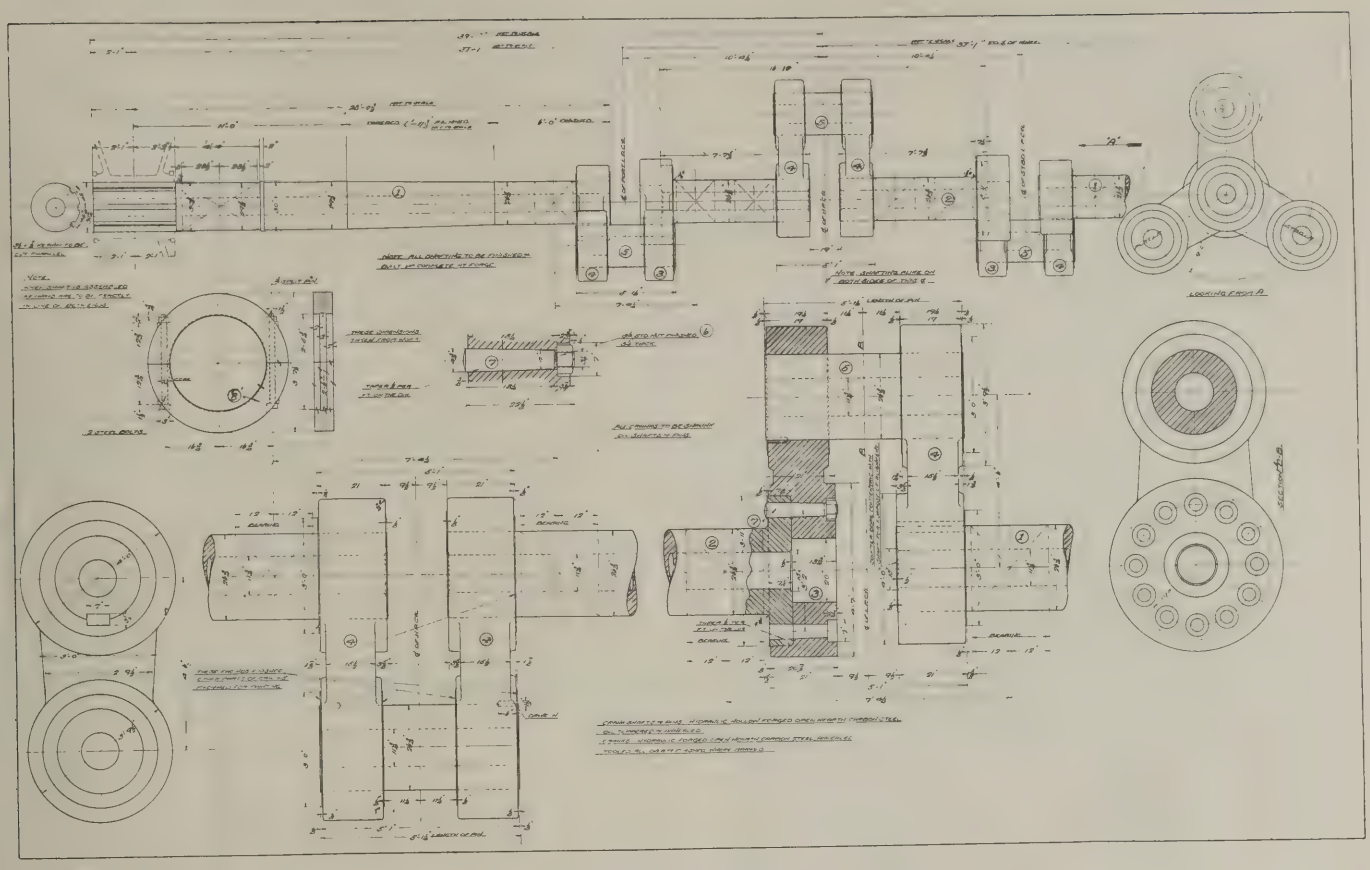
The power plant of this steamer is in proportion to the size of the steamer itself, and hence is no small affair, being designed for the development of 12,000 H. P. There are nine boilers in the steam plant, all of the Scotch type. Six of them are of the ordinary single end construction, 14 ft. diameter, 10 ft. 11¼ in. long, and three of the double end type, 14 ft. diameter, 21 ft. 10½ in. long; all built for 165 lbs. working pressure. The single end boilers are peculiar in that their shells are made up of but a single sheet as to length, there being no circumferential seam, as is usual. The double end boilers are necessarily made with two sheets, but have only one circumferential seam in place of the usual two. There are twenty-four 54-in. Morrison corrugated furnaces, two in each of the single end boilers and four in each of the double end boilers. The total grate surface in these boilers is 590 sq. ft., and the heating surface is about 27,600 sq. ft. The grate bars are all 5 ft. 6 in. long.

The boilers are installed in three compartments with athwartship coal bunkers between, thus forming four fire holds. The bunkers are so placed that the coal is practically self-trimming onto the fire floors, thus necessitating but little coal passing. There are four smoke stacks, all jacketed to the top of the dome and protected from the cabin by steel casings insulated with cell board.

A complete system of Howden draft is fitted to the boilers, air being supplied by four No. 9 Sirocco blowers of 37,500 cu. ft. capacity each, and each driven by American Blower Co. 7 x 7 engines, double enclosed, direct-connected. By a suitable arrangement of dampers and cross ducts, any blower can be made to supply air to any boiler, so in case of one or more blowers being disabled, the system will not be completely out of commission. Fire hold floors are all of ribbed steel plate, supported on angle iron frames. Two hydraulic ash guns are installed in each fire hold, and two 40-in. diameter ventilators in each hold serve to bring fresh air down from outside. The tops of the ventilators can be turned from down below so the firemen can arrange their ventilation to suit their requirements.

The Main Engine

The main engine is installed in a compartment by itself immediately aft of the boilers. Practically the entire engine is under the main deck, only the tops of the main bearings, the upper part of some of the valve gear and the handling levers, projecting above the level of the deck. The engine is of the three-cylinder, compound, inclined type with one high pressure cylinder 66 in. diameter and two low pressure each 96 in. diameter, all with a stroke of 108 in. The cylinders are located aft of the shaft, the high pressure in the center with the low pressures on either side. They are beautiful specimens of the founders' art, being practically without flaw and are further remarkable in that they are the largest engine cylinders ever cast in



DETAIL OF CRANK AND WHEEL SHAFTS OF THE CLEVELAND & BUFFALO TRANSIT CO.'S NEW STEAMER SEE-AND-BEE

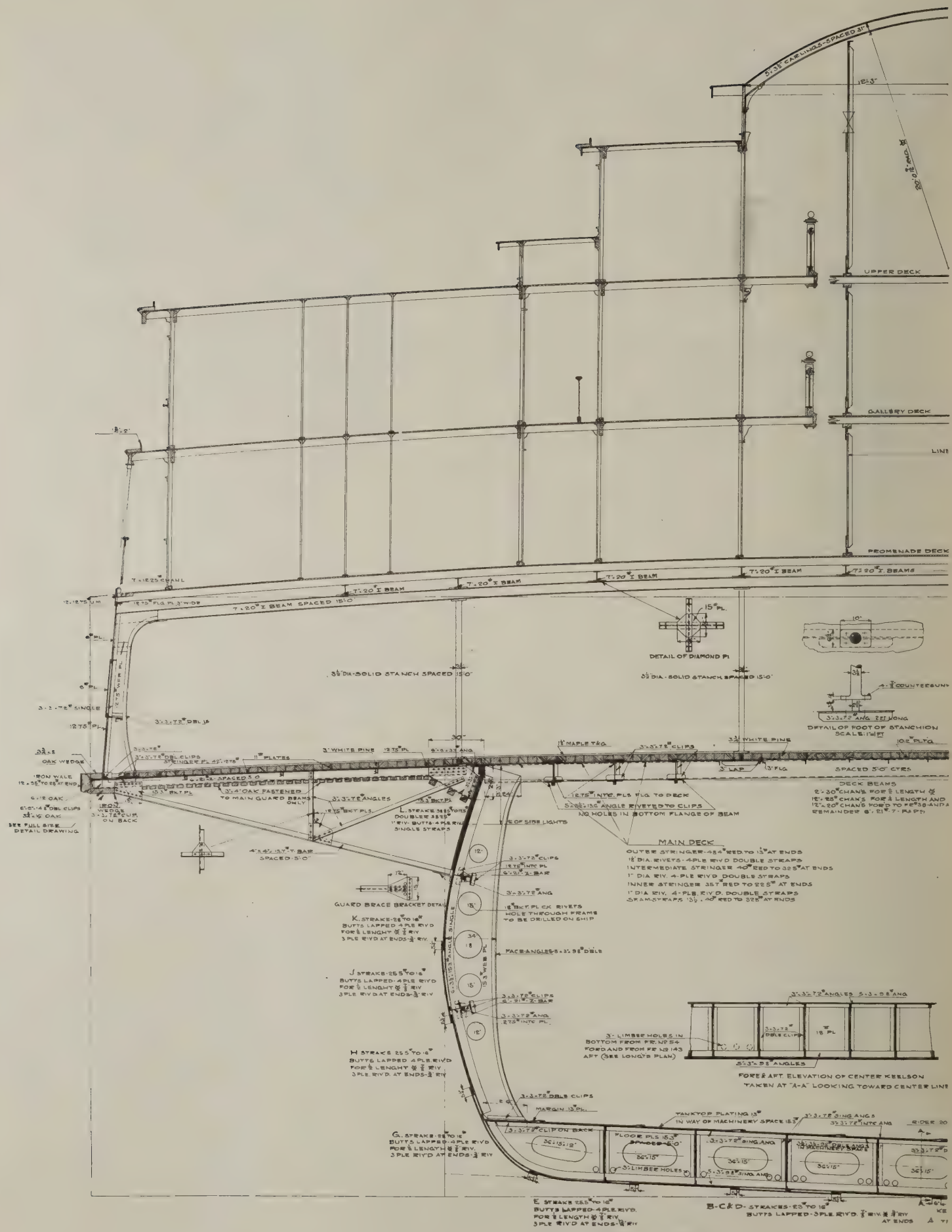
the lake region. The low pressure cylinders are about 13 ft. long and 13 ft. high over the steam chests. All the cylinders were molded on ends in loam molds. The open end was cast down, this being the usual practice of the makers. The mold was parted on the center line of the steam chests, also in the center line of the cylinder and drawbacks were made on the upper steam chests. These partings were made to enable setting of the cores with greater accuracy. The radial cores for the crank end of the cylinders were suspended from the top plate of the mold, and the center of main core, was put in place last. The contract called for 30,000 lbs. tensile strength, but all test bars showed better than the requirements. The rough casting of one low pressure cylinder weighs 65,760 lbs., the other 67,200 lbs. The high pressure weighed 54,000 lbs.

Heavy Forgings

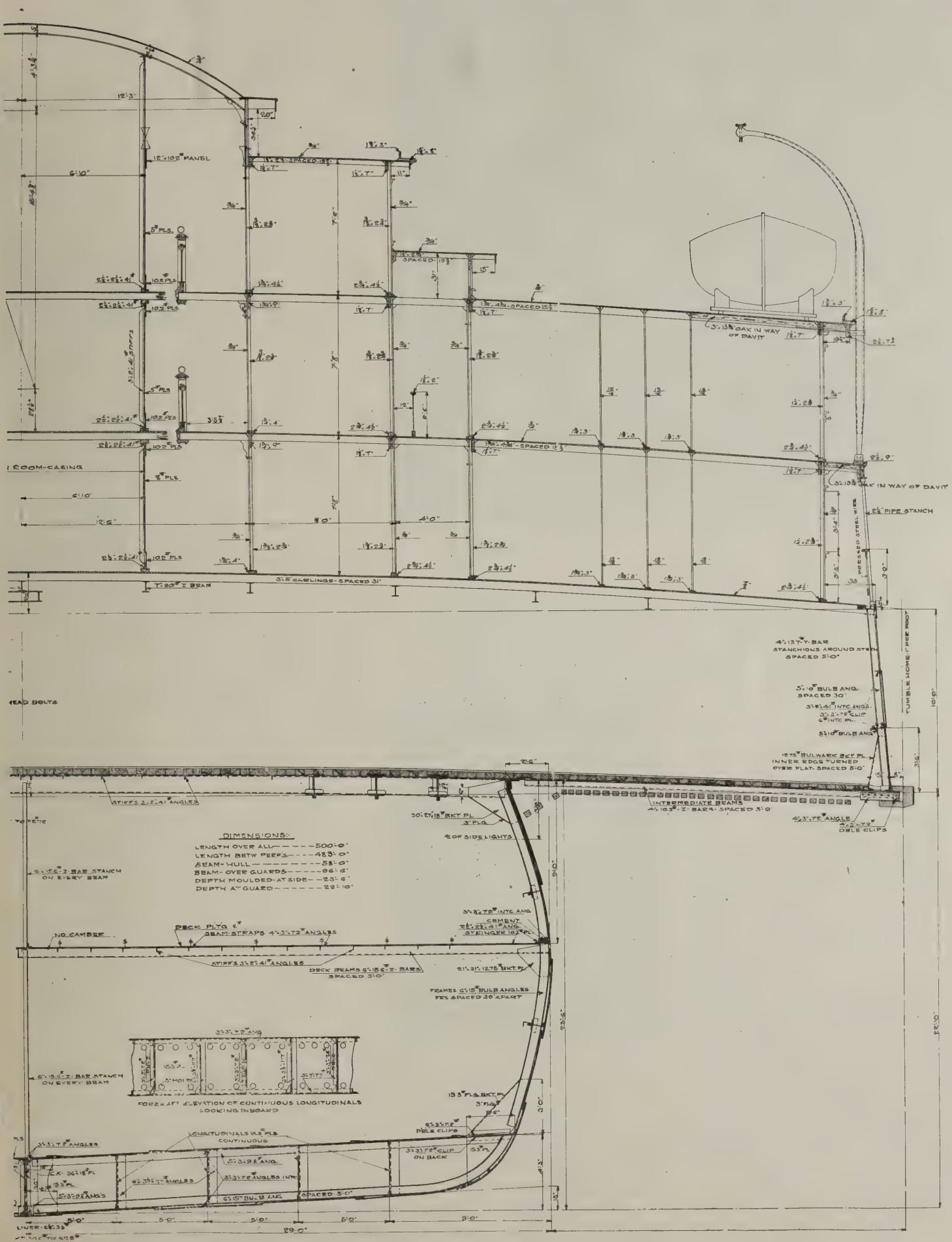
The main shaft is of open-hearth steel, hydraulic hollow forged. It is 26¾ in. diameter in the main journals, 29¾ in. diameter in the outboard bearings, is 78 ft. 6 in. long and has an 11¾ in. hole throughout the entire length. The shaft weighs 120 tons. It is made in three sections. The high pressure crank and the adjoining pieces of shaft form the center section, while the two wheel shafts with the low pressure cranks attached form the two side sections. The sections are bolted together with flange couplings which are counterbored into the inboard low pressure cranks and bolted with tapered bolts. These forgings are the largest that the Midvale Steel Co. has ever turned out.

The main journals are massive steel castings with flanged bases bolted directly to the structure of the ship, which is at this point made exceedingly heavy and strong. The bearings are steel shells lined with best babbitt metal, the upper half being hollow and having cold water circulated therein. The outboard bearings, next to the paddle wheels, are also of cast steel with babbitt-lined shells. They are made adjustable in fore and aft direction by means of wedges and vertically by jack screws and shims. The crosshead slides are open-hearth steel forgings, attached to the main journals by two very large bolts passing through a "T" end on the slides. The cylinder ends of the slides have circular flanges by means of which they are attached to the cylinder with six bolts each. About the middle of the length of the slide, a substantial stanchion is placed with its lower end resting on the engine foundation girders. The connecting rods are of open-hearth nickel steel, highly finished. The crank end is bored out and sawed apart to receive the babbitt-lined brasses of the crank pin bearings. The cap is attached to the rod by two substantial nickel steel bolts. The crosshead end is forked and has flat back brasses attached with steel binders and bolts. The rods are 21 ft. 2 in. long, center to center, and weigh about 11½ tons finished. The piston rods are also of nickel steel, 12½ in. diameter and are attached to crosshead and pistons with taper and nut. The crosshead bodies are nickel steel forgings with babbitt-lined cast steel jaws bolted on. Pistons are of cast steel, conical, single thickness body with cast iron bull ring and packing rings; two packing rings each piston are double, each being made up of a square section ring laid in bosom of angle section ring, both rings being cut into lengths of about 18 in., joints broken and the whole set out against cylinder walls by light flat springs.

There are two air pumps and two condensers; one for each low pressure cylinder located under the low pressure crosshead slide with the buckets driven by forged steel rock arms from the low pressure crossheads. The pumps are 62 in. bore



MIDSHIP SECTION OF THE CLEVELAND & BUFFALO

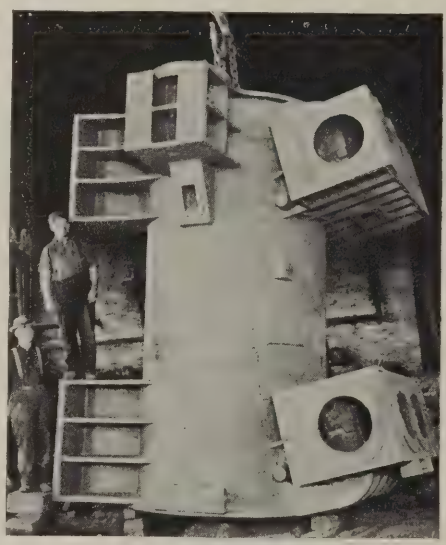

DIMENSIONS:-
LENGTH OVER ALL - - - - 500'-0"
LENGTH BETW PERPS. - - - 483'-0"
BEAM-HULL - - - - - - - - 58'-0"
BEAM-OVER GUARDS - - - - 66'-6"
DEPTH MOULDED-AT SIDE - - 23'-6"
DEPTH AT GUARD - - - - - - 22'-10"
FORE & AFT ELEVATION OF CONTINUOUS LONGITUDINALS LOOKING INBOARD
TUMBLE HOME 1" PER FOOT
NO CAMBER
29'-0"

TRANSIT CO.'S NEW STEAMER SEE-AND-BEE

LOW PRESSURE CYLINDER, STEAMER SEE-AND-BEE

and 41½ in. stroke. A bilge pump and a direct connected feed pump are both driven off each air pump crosshead. The condensers are built up of riveted plate and each low pressure cylinder connects with its own condenser through a 24-in. exhaust pipe.

The high pressure cylinder is equipped with poppet steam and exhaust valves, and the low pressure cylinders have Corliss valves. The driving mechanism for all these valves is an innovation in marine work, in that the Walschaert valve gear, so familiar on locomotives, is applied for wrist plate drive on the low pressure cylinders and for the poppet gear on the high pressure cylinder. The principal reason for adopting this gear was the desirability of one eccentric on the main shaft for each cylinder and the advantage of short eccentric rods; also that the links take up less head room. Cut off in the high pressure cylinder is adjustable by means of Sickles cut-off gear with a range from ¼ to ¾ stroke. The regulating stands for the cut-off gear are located on the handling platform close by the other control levers, so the engineer on watch can readily make any adjustment he desires without leaving his station. The reversing mechanism of the engine is operated by a large steam cylinder controlled by the usual hand lever. An auxiliary reversing gear consisting of worm and worm wheel, is fitted for hand use at such times as the steam gear may be out of commission. The main throttle valve, 18 in. in diameter, is of the Schuette-Koerting balanced type and is controlled by a direct



HIGH-PRESSURE CYLINDER, STEAMER SEE-AND-BEE

hand lever and is fitted with a 7-in. auxiliary or maneuvering valve. There is also a 7-in. passover valve fitted, which admits steam directly to the low pressure cylinders in case the high pressure crank happens to be on center. The lubricating system is elaborate and complete as are the appliances to assist in the overhauling or lifting of the engine parts.

The two paddle wheels are 30 ft. in diameter over the outer edge of the buckets, and 32 ft. 9 in. in diamter over the rims. They are of very massive construction, having hubs of cast steel and arms of wrought iron forgings, with the trunnion hubs forged on the arm. There are eleven buckets in each wheel, 14 ft. 10 in. long, 5 ft. 1 in. wide, of 1⅜ in. thick steel plate. The bucket brackets are all of cast steel with forged steel trunnion pins. Heavy forged radius rods with cast steel eccentrics and bearings, form the feathering mechanism which is carried on substantial steel spring beam outside the wheels. The finished wheels will weigh about 100 tons each and are designed to cope with the severe ice conditions met with on the Buffalo run in the early spring.

Electrical Equipment

The electrical equipment of the new steamer will be unsurpassed. Altogether there will be 4,500 lights aboard the ship. Practically every function that can be electrically performed will be so performed. The generating sets consist of three 75 kilowatt Kerr turbine-driven Northern generators, direct-connected to dynamos and, along with the main switch board, located in the engine room on the main deck. The boat will be wired throughout with the new National Board of Underwriters marine core wire, and the conduits for carrying the wire will be of galvaduct. The main switch board will be equipped with automatic circuit breakers and also double throw switches so that all power can be put on any dynamo should it be necessary. All fuses in switch board and distributing boards will be of 250-volt National Code type. The circuits are so arranged that the electrician can disconnect any number and combination of lights, still leaving light enough to get around. This is convenient, of course, for the night lighting of the ship when fewer lights are required.

The telephone system is in full equipment exactly similar to a system in vogue in cities, having motor generator for calling and a central storage battery for talking. There are over 500 telephones on the boat, one in every stateroom, as well as in the officers' quarters and in the telephone booths, with the main switch board in the social hall. It is, therefore, possible for the traveler to have communication with the officers of the ship with which he has direct dealing, such as the purser and the steward,

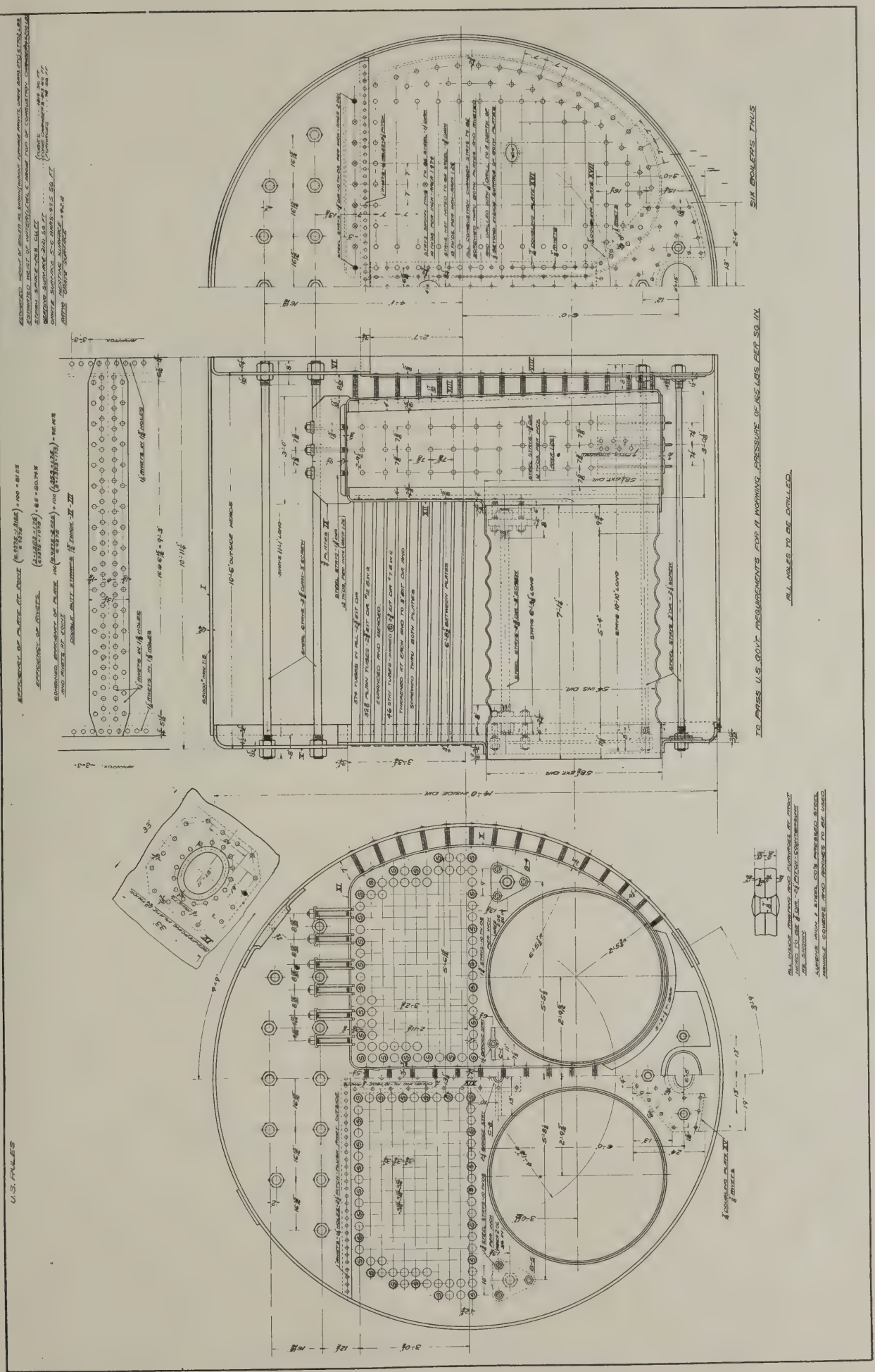


DIAGRAM OF THE SINGLE-ENDED BOILERS, OF WHICH THERE ARE SIX, ON THE CLEVELAND & BUFFALO TRANSIT CO.'S NEW STEAMER SEE-AND-BEE

or with any fellow traveler in another stateroom, or while the ship is at dock with anyone in the city. In addition, of course, to this public telephone system, there is a private system for the operation of the ship leading from the pilot house to the engine room and other departments.

Equipped with Wireless

The steamer is, of course, equipped with wireless and also carries an auxiliary storage battery plant which will operate for six hours if by any accident the boilers should be put out of commission. Alarm boxes are placed at convenient intervals which are rung at stated times by the night patrol and register in the pilot house. An automatic signal board placed in the pilot house controls the signal lights of the ship. These lamps are carried in duplicate, one dormant and the other burning, and if by any chance the burning light goes out, the other is automatically thrown in and registers in the pilot house. Assurance is, therefore, given that the port and starboard and other signal lights are always burning, or at any rate that if anything is wrong with them it is immediately announced. The steamer is also equipped with an electric whistle device for sounding signals and can also be arranged to automatically blow the fog signal at prescribed intervals during thick weather.

In addition to the usual engine telegraph, the means of communicating intelligence from the pilot house to the engine room are many, including an electric signal bell system and also an electric indicator connected with the main shaft, which indicates whether the engines are going forward or astern. The system of electric fans throughout the boat is quite complete and is especially elaborate and painstaking in the dining room. All the drinking water is passed through copper tubes and purified by electricity before being served. Many of the functions of the galley are also performed by electricity, such as potato peeling and dish washing.

The meters in the switch board are of Weston make with General Electric sockets and Crouse-Hinds distributing panels.

The new steamer will be equipped with a 32-inch searchlight, the largest on the lakes.

Auxiliary Machinery

A very complete equipment of auxiliary machinery is installed, part of which has been mentioned in the early part of this account. The main feed pump is a 16-24-24 by 24 in. Blake tandem compound simplex pump of very massive construction. This pump will not be much used, as it is expected that the connected feed pump on the main engine will take care of all feed requirements. An auxiliary feed pump is also fitted, 14 and 8 by 12 in. Blake duplex. The fire and general service pump is a 16 and 9 in. by 12 in. duplex underwriters' pump, located on the main deck where it will be readily accessible. The fresh water service on the ship is cared for by an 8 and 10 in. by 12 in. Blake duplex pump, drawing water for four fresh water tanks of a combined capacity of 17,000 gallons.

The water for drinking purposes is all purified by an electrical apparatus furnished by the Water Purifying Machine Co., of Buffalo, N. Y.

The water closets and other sanitary systems are supplied with water by a tandem compound duplex pump 8 and 14 in. by 14 and 12 in. This pump also supplies cooling water to the main engine journals, the auxiliary injection spray heads in the main condenser and other service of similar nature. The sprinkler system throughout the ship is supplied from an 8 in. Terry turbine driven centrifugal pump located in the hold but with the throttle valve within easy reach from the handling platform so the pump can be started without going below.

As the steamer is equipped with a full water bottom ballast system, a pump is necessarily required to handle the water and accordingly a Blake vertical cross compound duplex pump 15-24 and 24 by 18 in. is installed connected to the water tanks with discharge overboard and to the trim tanks which are located on the guards.

The refrigerators and food storage spaces are cooled by a 10-ton carbonic anhydride refrigerating machine built by Kroeschell Bros., of Chicago.

The forward funnel is fitted with one 10 in. and 26 in. whistle and one 6 in. organ whistle.

The ashes are discharged outboard by eight hydraulic double jet ash ejectors of improved design. The stoke holds are roomy and well ventilated, and designed with safety escapes and with view of comfort for the stokers.

A Schuette & Koerting film feed water heater, made by the Schuette & Koerting Co., of Philadelphia, Pa., is installed, designed to raise the temperature of 200,000 lbs. of feed water from 130 at hot well to 200 at delivery with 4 lbs. back pressure.

All steam and feed piping throughout the ship is covered with 85 per cent magnesia sectional covering and in exposed places the covering is jacketed with galvanized iron. All flanged joints are straight faced with slight retaining grooves for the gaskets.

Decorative Features of the Ship

The decorative features of the vessel have been entrusted to Louis O. Keil, the marine interior decorator, who has designed the interiors of a great many steamers, notably those of the Hudson River Day Line and the Detroit & Cleveland Navigation Co. The keynote of the decorative scheme is a rich simplicity. Elaborate ornamentation has been suppressed and the result is:

The first thing that a traveler sees, of course, about a steamer, is the lobby. This is very spacious, quite as large, in fact, as the lobby of an ordinary hotel, containing the purser's and steward's offices, telephone booths, parcel and baggage rooms, and a lunch counter, the entrance of which is gained through a doorway. The lobby is designed in the Tuscan order of architecture. The walls are paneled in mahogany inlaid with various woods and the colors are in keeping with the general dominant tone of this aristocrat of woods. The ceiling decorations will be in bronze and Roman verd. Light will be obtained from ceiling and wall brackets of appropriate design. A feature of the lobby that marks quite a departure from the usual sidewheeler on the lakes is that the grand stairway leading to the promenade deck is inclosed in a vestibule with sliding doors. The purpose of this is to shut the stairway off immediately in the event of a possible fire, a very remote contingency, it must be admitted.

The main dining room is immediately abaft the purser's and steward's offices on the main deck, extending to the stern of the ship. It is carried out in Adams design with mahogany and white enamel. In addition to a banquet room 24 ft. long on the starboard side and two private dining rooms on the port side, there are a number of alcoves with bay windows on both port and starboard sides of the main room where one may have a fair degree of privacy in dining. Light is obtained from Sheffield silver candelabra carried on columns, as well as Sheffield silver wall brackets. The extreme outer end of the main dining room is taken up with a great sideboard with dumb waiter leading to the buffet on the orlop deck below. The dining room is 72 ft. long, 60 ft. wide at the forward end, taper-

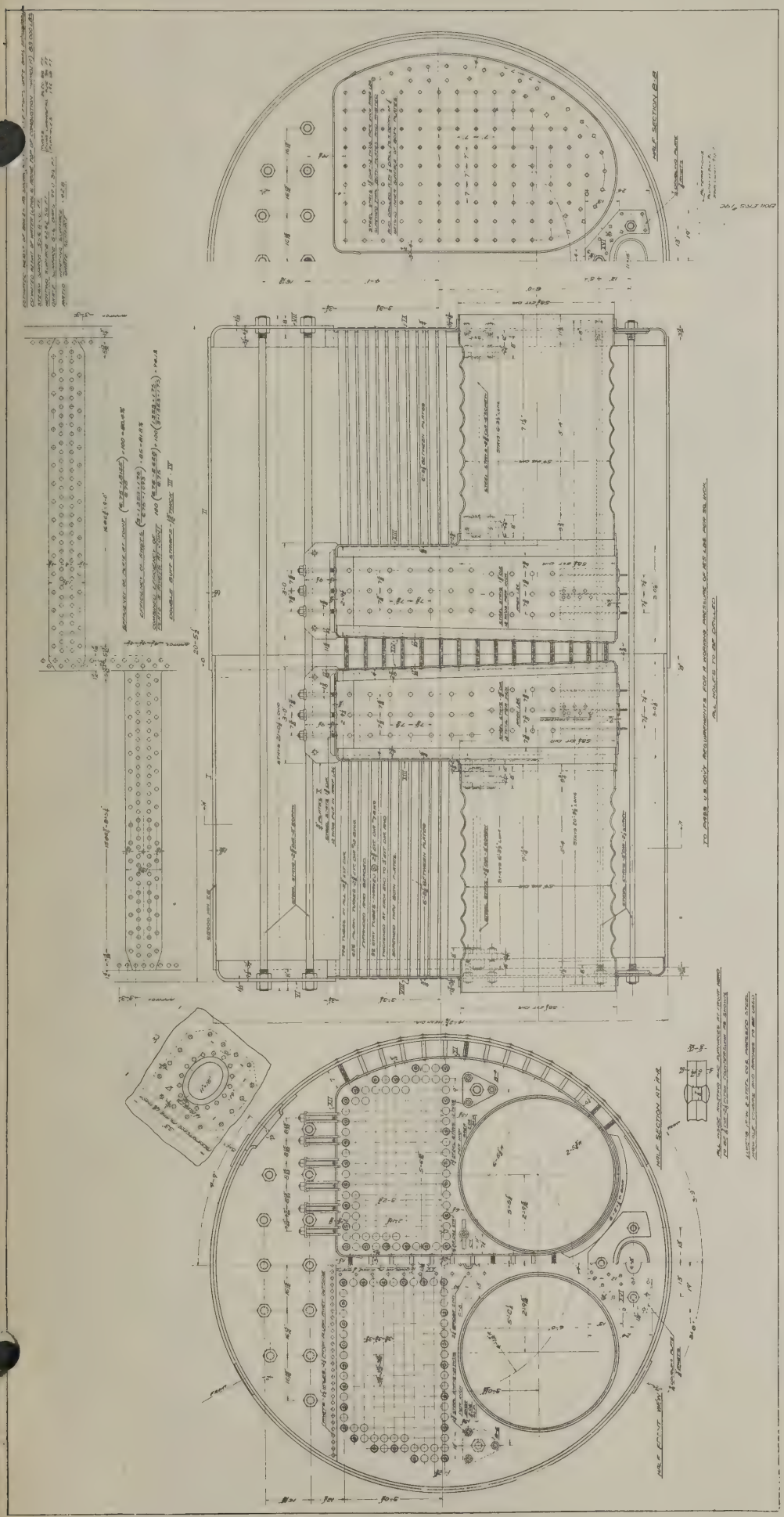


DIAGRAM OF DOUBLE-ENDED BOILERS, OF WHICH THERE ARE THREE, ON THE CLEVELAND & BUFFALO TRANSIT CO.'S NEW STEAMER SEE-AND-BEE

ing to 32 ft. aft, and will seat 170 persons at one time. The location of the dining room on the main deck is a happy one, as it permits the passenger to look out over the waters as the boat speeds along. This feature was first introduced on the lakes on sidewheelers on the City of Detroit III, and was much appreciated by the traveling public, the dining room hitherto having been located on the orlop deck.

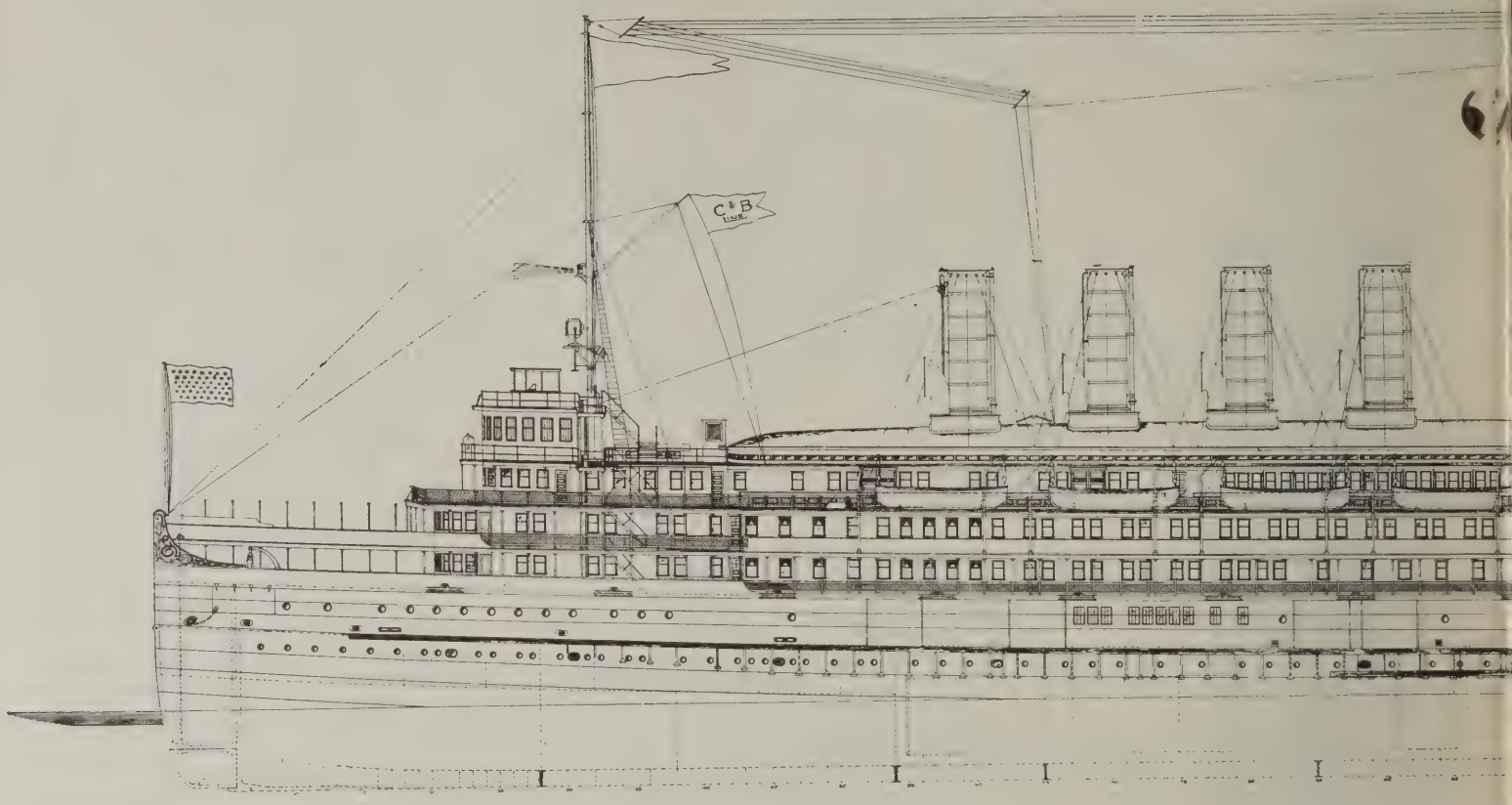
The buffet, as stated, is directly under the dining room and is approached by a stairway on the main deck aft. It will be in tavern design after the manner of an old English inn and will call to mind the remark of the great Dr. Samuel Johnson, that nothing was ever contrived that gave mankind so much creature comfort as a good tavern.

The Main Saloon

Passing from the lobby through a vestibule and up a wide and handsome flight of stairs one enters the main saloon, upwards of 400 ft. long, on the promenade deck, and subdivided for convenience into several sections, having flower booths, a book and periodical store, observation room and ladies' writing room amidships and men's writing room forward. The style of the main saloon is in the Ionic order of architecture, having a wainscot of carefully selected mahogany highly finished, the upper part finished in fine enamel The general effect, however, will be one of perfect simplicity and no decorative features whatever will be attempted except that the ceilings in both forward and after sections of the saloon and the cross-bulkheads formed by the stair landings will have mural paintings. The main dependence for decorative effect will be in the ceiling painting which will be devoted wholly to one subject and will be executed by one of the foremost mural painters in the United States.

The general color scheme of the gallery deck will be gray, ivory and white, chaste, simple and refined. At the after end of the gallery deck is the ladies' drawing room of Italian renaissance design with built-in seats at after end in walnut. The furniture in this room will be of walnut covered in tapestry and the floor covering of the best Wilton. The room will be lighted by ceiling fixtures and the general color scheme will be rose.

On the upper deck immediately above the drawing room will be located the atrium. The meaning of an atrium is a Pompeiian court with



OUTBOARD PROFILE OF THE SIDEWHEEL PASSENGER STEAMER

sleeping rooms adjoining, and of course it is quite apropos to call it such, as the staterooms actually do adjoin, with molded entablature extending around entire court. Wall pilasters at the forward end support a pediment. It will be carried out in the full spirit of a Pompeiian court, the color scheme being light, but relieved by rich Pompeiian colors, flower stands about the room and the ceiling painted to represent the sky and the open air. The electric fixtures will be in the form of bronze torches and everything will be in keeping with Pompeiian thought. In the center will be an open well looking down upon the drawing room.

In this connection it is pertinent to note that a balcony for orchestra will be located at the after end of the main saloon, just forward of the ladies' drawing room on the gallery deck above. It will thus be observed that the orchestra is so placed that its music reaches not only the main saloon but the drawing room and atrium on the upper decks as well.

Probably the most popular feature of the ship will be the lounge on the upper gallery deck amidships. It will be conventional in design, finished in fumed oak, and the decorative features in L'Art Nouveau will be painted right on the wood. The stack casing which penetrates this room will be utilized to carry panel paintings. This room may also be reached by a forward stairway leading from the promenade deck between the stacks to the upper deck, carrying electric fixtures in L'Art Nouveau on the newell posts. An air of comfort and coziness will be imparted to the lounge by numerous little bays on both port and starboard sides where one may indulge in light refreshments, such as ice cream, which will be served from a counter built-in at the after end of the lounge. This counter will be a model of sanitation, being constructed of opal and German silver. As this will be a common meeting ground for both men and women, the purpose is to make it as inviting and comportable as possible. The floor will be of asbestolith which will be divided into squares by brass strips to represent tiling. With its fumed oak furniture this room will doubtless prove a very attractive one.

Bordering the main saloon will be a number of parlors, the principal ones being named by courtesy in honor of the president, general manager, traffic manager and directors. Each room will be of different de-

DATA OF STEAMER SEE-AND-BEE.

Hull, length, keel, 485 ft.; overall, 500 ft.; breadth, 58 ft.; over guards, 96 ft. 6 in.; depth, 23 ft. 6 in.

Engines, inclined three-cylinder compound, 66 in., 96, 96 x 108 in. stroke.

Boilers, six single-ended 14 ft. x 10 ft. 6 in., two 54-in. furnaces. Three double-ended, 14 ft. $2\frac{5}{16}$ x 20 ft. $5\frac{1}{2}$, four 54-in. furnaces. Working pressure, 165 lbs. All grates 5 ft. 6 in. long. Total grate surface, 594 sq. ft. Ratio, 42.8.

Howden draft. Four No. 9 Sirocco blowers, direct connected to double 7 x 7 American Blower Co. enclosed engines.

Heater, one Schutte & Koerting film 200,000 lbs. capacity.

Feed pumps, two 8 in. diameter x $41\frac{1}{2}$ stroke, connected to main engine. One Blake 16-24-14 x 24 independent horizontal simplex plunger type.

Wheels, 32 ft. 9 in. overall, 11 buckets 5 ft. wide, 14 ft. 10 in. long, $1\frac{3}{8}$ in. thick.

Draught of water, mean, 14 ft.

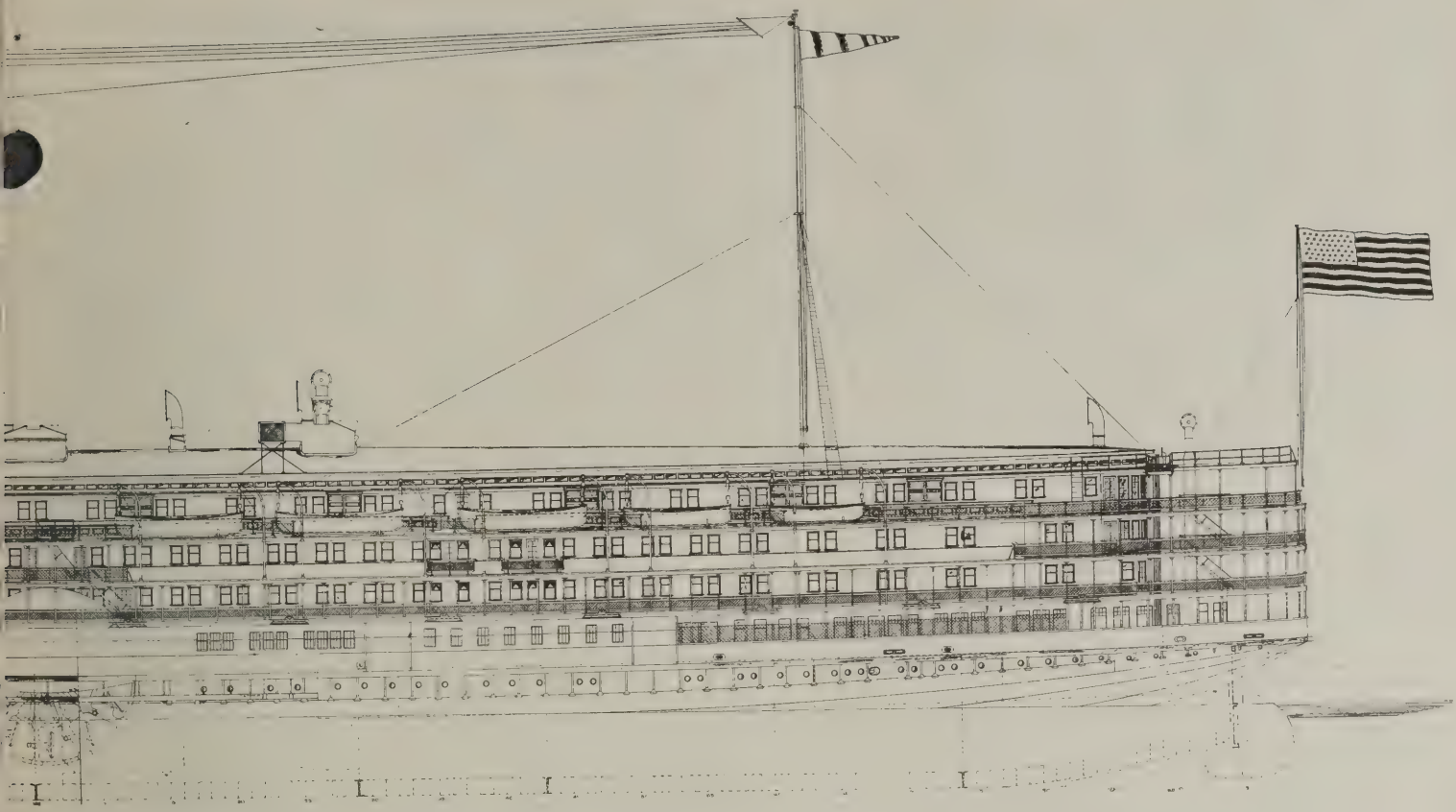
Total heating surface all boilers, 25,452 sq. ft.

I. H. P. at 31 revolutions—558 piston speed.

$$\frac{558 \times 49 \text{ M. E. P.} \times (\text{area (2) lows}) \ 14476.5}{33{,}000} = 11{,}974 \text{ I. H. P.}$$

Weight of Parts.

	Tons.
Low pressure cylinders	33
High pressure cylinder	29
Connecting rods	12
Paddle wheels complete	100
Main shafting	120
Boilers without grates	408



See-and-Bee of the Cleveland & Buffalo Transit Co.'s Fleet

sign, being finished in either vermilion wood, satin wood, mahogany, red gum wood, silver gray maple, prima vera and enamel. The furniture and decorations of each of these parlors will be in keeping with the character of the wood finish. Each parlor will contain twin brass beds, a divan, tables, dressers, chairs, mirrors and plenty of cushions to lend an air of comfort. Each of these parlors will have a private bath finished in pure white enamel, and in addition the rooms which are named in honor of officers of the company will have private balconies. The lighting fixtures of the parlors will be carried out in Sheffield silver and Tuscan gold. Some of the parlors will moreover be paneled in silk, brocade and finely embroidered curtains which richly dress the windows.

Naval Architects and Marine Engineers

The twentieth annual meeting of the Society of Naval Architects and Marine Engineers will be held in the Engineering Societies building, 29 West Thirty-ninth street, New York, on Nov. 21 and 22, followed by a banquet in the Astor gallery of the Waldorf-Astoria on the evening of Nov. 22. The program of papers to be discussed is as follows:

Thursday, Nov. 21, 1912.

"Experiments on the Fulton," by Prof. C. H. Peabody, member of council.

"The Design and New Construction Division of the Bureau of Construction and Repair, Navy Department." by Naval Constructor R. H. Robinson, U. S. N. member.

"Engineering Progress in the U. S. Navy", by Capt. G. W. Dyson, U. S. N.

"Marine Lighting Equipment of the Panama Canal," by James Pattison.

"The Lightship," by George C. Cook.

"Oil Fired Marine Boilers," by E. H. Peabody, member.

"The Preservation of the Metals Used in Marine Construction," by Lieut. Com. Frank Lyon, U. S. N.

Friday, Nov. 22, 1912

"An Electrically Propelled Fireproof Passenger Steamer," by W. T. Donnelly and G. A. Orrok, members.

"Notes on Fuel Economy as Influenced by Ship Design," by E. H. Rigg, member.

"Different Applications of the Marine Gyro in Science," by Elmer A. Sperry, member.

"Rudder Trials of the U. S. S. Sterett," by Asst. Naval Constructors R. T. Hanson, U. S. N., and J. C. Hunsaker, U. S. N., juniors.

"Logarithmic Speed Power Diagram," by Thomas M. Gunn.

Piers for High Level Bridge

The Great Lakes Dredge & Dock Co., of Cleveland, has secured the contract for the construction of nine land piers for the new high level bridge over the Cuyahoga river at Cleveland, as well as the capping of the two river piers, the contract involving an expenditure of $498,000. Piers 1 and 2 will have two caissons in each. These are located on the hill side. The three piers on Merwin street will have deep cofferdams and the four piers near the Erie station will be based on concrete piles. About 27,000 cubic yards will be excavated in the wet and 20,000 cu. yds. in the dry. Between 3,000 and 4,000 tons of steel sheet piling will be used and about 30,000 yds. of concrete. The contract calls for the completion of the work in 600 working days.

The Greenport Basin & Construction Co., Greenport, L. I., is building a tug 75 ft. long for the Breakwater Co., of New York, for service in Honolulu, where it is building a breakwater from the lava of an extinct volcano. The tug will be shipped to Hawaii in a knocked-down condition.

THE MARINE REVIEW

DEVOTED TO MARINE ENGINEERING, SHIP BUILDING AND ALLIED INDUSTRIES

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November, 1912

Artificial Waterways on the Lakes

Few people realize the extent to which the commerce of the great lakes is cared for in artificial channels, but in the run from Duluth to Buffalo vessels traverse a waterway that for 50 miles is wholly artificial, that is to say canals, locks, and straightened and deepened channels in the rivers. The latest of these and one of the greatest was dedicated to commerce on Oct. 19—the Livingstone channel at the mouth of the Detroit river, making a downbound track for vessels and eliminating the Limekiln Crossing, hitherto the point of greatest concern to the navigator on the whole chain of lakes.

The interesting part of the work was the building in the dry of the channel opposite Stony Island. The river at this point was cofferdammed and unwatered, the contractors taking chances in finding underground seams in the rock or the flooding of the area through unusually high stages of water. None of these things fortunately developed and the work was prosecuted to a successful conclusion in the dry, meanwhile being an object of great interest to thousands of visitors. The government spent about $6,600,000 on the work and congress named the channel in honor of William Livingstone, president of the Lake Carriers' Association, who had conceived it.

In appropriating money liberally for the widening, deepening and straightening of lake channels, the government displays the highest wisdom. The area to be improved is slight in comparison to the area which needs no improvement, namely, the open lake, where nature has provided an adequate depth for all time. The government had only to develop 50 miles to make the remaining 950 miles serviceable. An examination of the figures will show that the freight rate has fallen coincident with the deepening of the channels. In fact, the saving of a penny a ton on the commerce that will annually pass through the Livingstone channel will repay the cost of the whole improvement in ten years. More than that, all that the government has ever spent in improving the great lakes is returned to the people annually in the saving of transportation costs. It is absurd to suppose that the vessel owner gets the benefit of the deepened channel. Whatever advantage he may have in the obtaining of a deeper channel is only momentary. The rate automatically adjusts itself to the changed conditions and the people get the benefit.

Importing Ship Material Free

Attention was directed in these columns last month to the rider in the Panama canal act admitting free of duty all materials intended for the construction, equipment or repair of vessels in American yards, irrespective of the trade in which they are to engage. The provision, of course, makes it possible to import materials for the construction of vessels to engage in our coastwise service. It may even make it possible to import the material to replace the equipment when it becomes worn out, but upon this particular feature the Treasury Department is expected to make a ruling. The measure has only been in effect a few months, but it has already become a serious menace to a number of American industries. If the United States is anything at all, it is a protective country and why on earth one industry should be singled out and denied the advantage of protection is more than we can understand. Protection is extended to every industry except shipping and now it is being denied to the makers of auxiliary equipment for vessels. If an American manufacturer makes a pump to install in a factory or office building, he is protected; but if he makes it for a ship, he is not protected. The same is true of the makers of all marine auxiliaries, and the sooner that that rider is rescinded the better it will be for American industry. It is unfair and un-American.

Assigned to Seats in Lifeboats

It is reported that the Toyo-Kisen-Kaisha has decided to assign its passengers to certain seats in its lifeboats. To each ticket sold is attached a coupon representing a certain seat with a printed request to the passenger to acquaint himself immediately on going aboard with the location of the particular boat with which he is allotted.

We are rather inclined to think that the primary effect of this would be to give the passenger a rather uncomfortable feeling. The last thing that a passenger thinks of is the safety of the ship. Moreover, the

arrangement has many absurd features. The vessel may have a list rendering useless the life saving equipment on the high side. Are the passengers so unfortunate as to be assigned to the boats on that side to be content to waive their claims to safety?

The conditions which obtained at the time the Titanic sank are very rare. The sea upon that occasion was quiet and no difficulty was experienced in lowering the boats and yet if the Titanic had had more lifeboats than were carried, it is doubtful if they could have been launched in time. The safety of the passenger lies in the hull of the steamship itself. With the hull well subdivided, both longitudinally and transversely for a fair distance above the waterline, the passenger is reasonably safe. Too much importance is being attached to life boats and life saving equipment. Dangers cannot be totally eliminated from travel either on land or sea, and he who travels either on railway trains or steamboats must expect to assume a certain risk.

Building in Borneo

It is not often that a small vessel is built at such an out-of-the-way place as Borneo, and therefore it will create some surprise that an order has been placed there for the construction of a steamer of 500 tons gross register. The builders are the China-Borneo Co., and the owners are the South Philippine Steamship Co., and the most surprising thing of all is that the vessel is to fly the American flag. It is certainly a strange thing that they can build ships for the foreign trade in Borneo to fly the American flag, while we cannot build them in the United States at all for that trade.

Statistics of Internal Commerce

If proposals recently suggested are worked out, the railroads will within a year or more be reporting the kinds and volume of commerce carried over their lines, as will also the steamship companies, to the Interstate Commerce Commission, in addition to the present financial statement that is monthly and yearly. This plan has arisen incident to the proposal of the reorganized Bureau of Domestic and Foreign Commerce in the Department of Commerce and Labor to eliminate hereafter the statistics on internal commerce. This bureau is not collecting the statistics this year, owing to the failure of congress to allow an appropriation. The figures were very valuable to the Interstate Commerce Commission and have frequently been used by the commission in estimating costs of service. It has been suggested that the commission itself arrange to collect this data in the future. It is believed that under the law the railroads and steamship lines could be required to make reports on the kinds and volume of commerce handled by them to the Interstate Commerce Commission.

These traffic reports are very valuable and it is regrettable that they should have gone so long uncollected. The Bureau of Statistics a few years ago took up the work of collecting the statistics of waterborne commerce, but as the giving of the information was not mandatory the statistics were obviously incomplete and some of the lines failed to furnish the information. There is no good reason why the information should not be forthcoming, and there are many why it should. It affords a very reliable index of the general growth of industry. If the power of the Interstate Commerce Commission to collect this data is not ample, it should be made so.

Enlarging Suez Canal

That the Suez canal authorities are alive to the changed conditions that will be brought about when the Panama canal is opened to commerce is clear from the recent declaration of Prince d'Arenberg, president of the Suez company, that the Suez canal will have to be enlarged to meet the increasing dimensions of ships, and in this view he is in line with the most progressive canal authorities of today. He recently said: "The Panama canal will be completed, that is now certain, within a time near at hand. I persist in believing that it must be looked on as a complement rather than a competitor of the Suez canal. The latter will always remain the shortest route from Europe to the extreme east, and will retain the superiority which the existence of frequent ports of call confer. It is not necessary to fear the Panama canal, on one condition, however, namely, that the Suez Canal Co. executes within the desired period the necessary works so as not to be behindhand in the march of progress. The Panama canal will be a wide and deep waterway, wider and deeper than the Suez canal in its present dimensions. A barrier must not arise between the Mediterranean and the Red Sea, a barrier not to be overcome by those vessels which commercial undertaking, impossible to predict in advance, might bring to the districts dependent naturally on the Panama canal from those which the Suez canal serves."

It is the opinion of Mr. Corthell that, if it is to retain its traffic, the Suez Canal Co. may give to commerce the canal dimensions that it requires. He declares that within a few years the Suez canal will necessarily have to be enlarged in order to hold its business, so that its depth will be at least 42.6 ft., allowing for a draught of 39.4 ft. with corresponding width to permit the passage in two lines of vessels of 25,000 tons.

The great development of the Dutch Indies, of Japan after the war, and the awakening of China, the opening up for foreign trade of Manchuria, a rich country of an immense superficial area, the very important export from Manchuria are indications demonstrating that the commerce between Europe and the countries situated on the far side of the Suez canal will undergo a very rapid change.

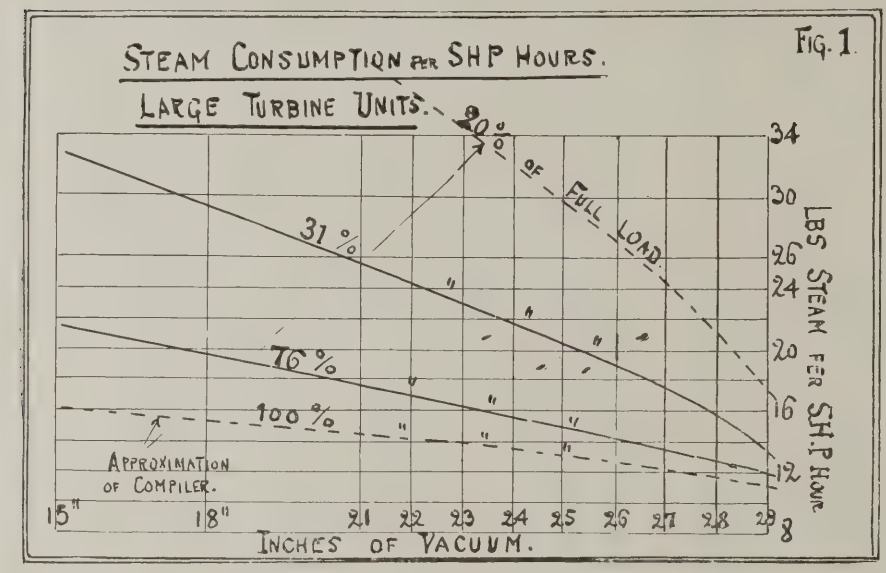
Marine Steam Engineering

Recent Developments of Steam Engineering Practice and Its Future Outlook—The Steam Turbine and Superheated Steam

By Theodore Lucas

DEVELOPMENTS take place repidly in all modern industrial expression of our times and not the least in the field of marine engineering. Until a few years ago steam seemed the only power available for economical or large ship propulsion, but now the most recent experiments in the field of internal combustion of heavy oils seem to open up a fine prospect for this type of machinery in many cases. It would, however, be somewhat premature if the enthusiastic advocates of this motive power see an immediate necessity for scrapping all steam power plant and it well pays to recall and study the fine strides that marine steam engineering has taken in the last few years. Many able technical and inventive minds contribute every year to the store of our knowledge how to make steam serve still better and still more economical.

But advance we must or we shall fall behind. Hardly have owners and builders made up their minds to consider substituting in certain suitable cases steam turbines for reciprocating steam engines that their attention is called to still higher forms of turbine economy than a direct drive will give. Good steam economy, say 12 to 14 lb. per S. H. P., it was called from high and medium speed turbines, and if the propeller efficiency was not quite the best, it was or is accepted for simplicity's sake as the best all around compromise. Now comes the newer forms of interposing mechanical or hydraulic gear reductions or reversing apparatus, or even mechanically separating turbine and propeller entirely with only electrical connection between them, that at once gain high efficiency from the turbine as well as from the propeller, and realizing also full backing power. An additional advantage of this last arrangement is that the same motive power of the main propulsion is also wholly or partly available for auxiliary purposes. This power application from one central source has, of course, great conveniences as electrical auxiliaries, while high in first cost, are fully able and reliable to fill all wants of auxiliary machinery on board ship.

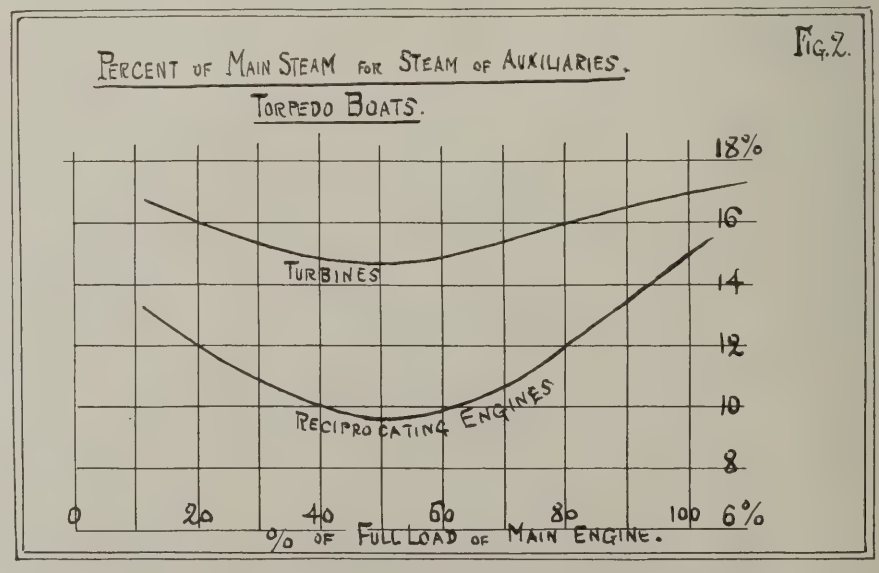


It is possible, however, that a prejudice will remain with many marine men against any power agent that is not direct-connected to the propeller at its most efficient revolutions or that is not able to answer immediately to a call for powerful positive and direct reversal and backing in urgent cases for avoidance of collisions or accidents.

The Old Reliable Reciprocating Engine

The old reliable reciprocating marine steam engine of multi-cylinder type fills all demands that reasonably can be made upon it for swinging its propeller efficiently as well as positively in any direction demanded. It is, however, deficient and inferior to the steam turbine in point of steam economy at maximum power and in revolving balance, which, in a steam turbine without reciprocating parts is, through its very nature, more easily perfect.

The ardent advocates of the steam turbine, however, were some six or eight years ago making light of some of the drawbacks that have loomed up bigger and bigger in the light of recent experience and that



have even led to serious consideration or even decision to return for heavy naval construction to reciprocating engines. The principal objections to the steam turbine, leading to this, are:

I. High number of revolutions and consequently reduced efficiency of propellers.

II. Expense or difficulty of getting full running balance of the high speed propeller, which frequently has set up vibrations of the hull nearly as serious and disagreeable as any reciprocating engine.

III. Difficulty of getting the very small clearances between the running and the stationary blades so well adjusted that no serious loss of efficiency by leakage may be incurred while still avoiding danger of touch and slipping of blades, which has proved to be very expensive in repairs.

IV. Greatly reduced efficiency at half or low powers, a very pronounced consideration for naval vessels.

V. Great dependence upon an extra good vacuum, 27½ inches or 28 inches now universally being demanded for turbine installations.

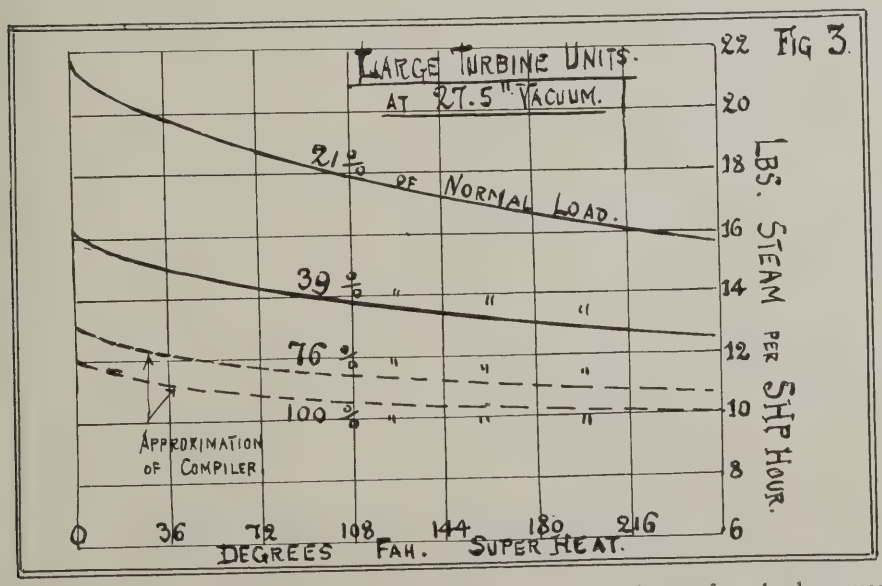
A number of tables as published before the German Society of Naval Architects, by the marine expert, Bauer, may well illustrate the points in view. Table I gives the clearances considered desirable for Parson turbines.

TABLE I.

	Large cruiser. In.		Torpedo boat. In.	
H. P. cruising turbine	0.044	0.052	0.040	0.044
L. P. cruising turbine	0.064	0.080	0.064	0.088
H. P. backing turbine	0.080	0.112	0.064	0.088
H. P. full power turbine	0.050	0.060	0.040	0.044
L. P. full power turbine	0.056	0.068	0.048	0.064
H. P. backing turbine	0.080	0.120	0.072	0.100

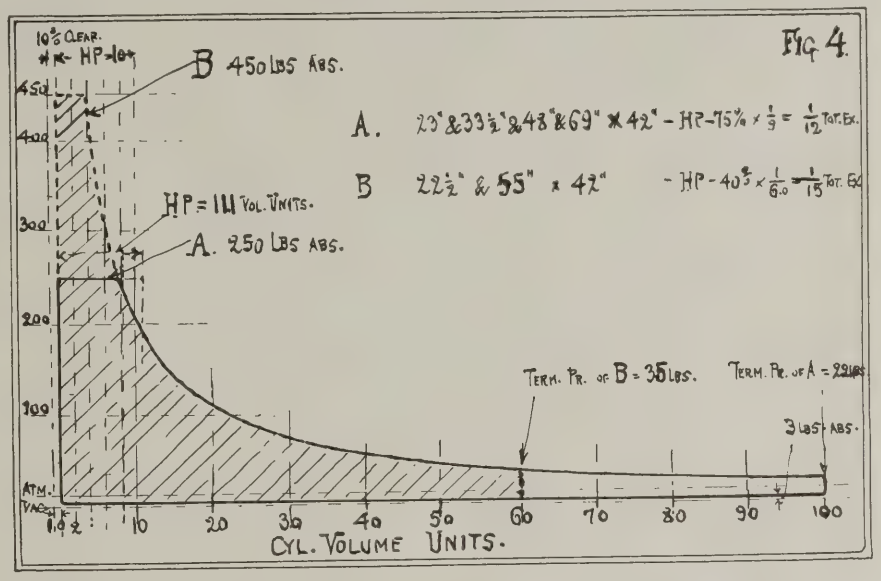
At full load with 27½ inches of vacuum it is stated that a S. H. P. may be realized at 12.1 to 14.3 lb. of steam per hour. How important the vacuum is for the economy of turbines is illustrated by Fig. 1, which gives steam consumption for 76 per cent and 31 per cent of normal load.

The steam consumption of the auxiliaries expressed as a percentage of the steam used by the main engines of torpedo boats is shown in Fig. 2 at decreasing percentages of the normal load. In 1901, the marine expert, James McKechnie, gave the weights of turbine machinery as only 70 per cent of that of reciprocating machinery of equal power.


LARGE TURBINE UNITS.
AT 27.5" VACUUM.
21½ % OF NORMAL LOAD.
39 % " " "
76 % " " "
100 % " " "
APPROXIMATION OF COMPILER
LBS. STEAM PER SHP HOUR.
DEGREES FAH. SUPER HEAT.
0 36 72 108 144 180 216
22 20 18 16 14 12 10 8 6
Fig. 3.

Since it has been found, however, that additions to the condensing apparatus are desirable, also more subdivision of main engines into forward and backing turbines, cruising and full power units, etc., so that the review by Bauer comes to the conclusion that for heavy naval and probably also mercantile outfits, the weights are practically equal. A saving of weight may be realized in torpedo boats of 30 knots with 13 per cent, 32 knots with 15 per cent, 36 knots with 16 per cent, and for small cruisers of 25 knots with 7 per cent to 10 per cent.

It is noteworthy that the economy of the steam turbine has practically remained the same during the last decade at approximately 12 to 14 lb.


10% CLEAR.
B 450 LBS ABS.
A. 23" & 33½" & 48" & 69" x 42" - HP-75% x ⅓ = 1/12 TOT. EX.
B 22½" & 55" x 42" - HP-40% x 1/8.0 = 1/15 TOT. EX.
HP = 111 VOL. UNITS.
A. 250 LBS ABS.
TERM. PR. OF B = 35 LBS.
TERM. PR. OF A = 22 LBS.
3 LBS. ABS.
ATM.
VAC.
CYL. VOLUME UNITS.
0 10 20 30 40 50 60 70 80 90 100
Fig. 4.

This is, of course, very promising for all steam engines and its effect upon steam turbines is illustrated by Fig. 3. The dotted curves are additions by the writer for approximate values at 75 per cent and 100 per cent of normal load. It should be noted in this connection that Mr. Parsons never seemed to be an ardent advocate of super-heating for turbines. Only wider experience will show if high temperatures should warp the shape or deteriorate the material of the numerous fine blades that depend for their efficiency upon so close an adjustment.

But the turbine is not alone any more in the field of high economy. In the last few years notable modifications of reciprocating engines have been produced that promise quite pronounced economies in steam consumption. This is made possible largely by reduction of initial condensation and thereby opens up the possibility of using economically shorter cut-offs and greater

temperature ranges with the possibility of simpler and less costly engines of fewer cylinders.

Two Notable Improvements

There are mainly two notable improvements which have originated or at least been brought to the latest stage of development by the Germans.

I. The poppet valve, high superheat, reciprocating engine, best known as the Lentz type after its designer.

II. The uniflow or through-flow engine, best known as the Stumpf type, after the designer of one form of it.

The first type avowedly pins its faith upon super-heat and even high superheat going as high as 750 degrees Fahr. with a super-heat of more than 350 degrees Fahr., and realizing apparently quite successfully as high as 20 per cent to 21 per cent of coal economy over saturated steam. The poppet valves are adopted to prevent rubbing motion of the steam distribution members, which, under the dryness of the superheat, might lead to scoring, leakage and large repairs. Inlet and outlet ports are separated, gaining thereby in efficiency through reduction of initial condensation. The poppet valves lend themselves also to small clearance spaces, in one case 7 per cent of H. P. cylinder for a Lentz engine against 14 per cent of a compared regular piston valve type. The arrangement of the Lentz engine has been carefully worked out in fair simplicity and the number of 300 installations—as quoted before the German Society of Naval Architects, seem to prove good life and wearing qualities of cams, springs and valve faces. Regular marine reversing gears of the type of Stephenson links or spiral feather sleeve gears are employed in but light scantlings as the friction is small and the wear not severe. In the summer and fall of 1906 the first conclusive comparison between a regular triple and a Lentz-triple engine was made by a French shipping company in two ships, duplicates in everything except engines and superheating arrangements. La Garonne with saturated steam of 195 lb. had an I. H. P. of 1,101, a M. E. P. referred to L. P. of 26.46 lb. per sq. in., and a coal consumption of 1.124 lb. per I. H. P. hour. La Rance with 536 degrees Fahr. steam temperature and a superheat of about 160 degrees Fahr. at 196 lb. pressure, had an I. H. P. of 1,290, a M. E. P. referred to L. P. of 30.58 lb., and a coal consumption of 0.898 lb. per I. H. P. hour, certainly a remarkable performance. The commercial result of these comparative installations was to show that La Rance, during 10 round trips of a year's operation, realized 18 per cent gain over the coal consumption of La Garonne. Another case of comparison was instituted by a German shipping company, installing a Lentz double compound engine, 2-26⅜ inches and 2-55 inches by 52½-inch stroke by 85 R. P. M. in their steamer Answald in opposition as a sister ship with a normal quadruple expansion engine for saturated steam. The Answald carries 202 lb. pressure at 626 degrees Fahr. to 716 degrees Fahr. steam temperature or 244 degrees Fahr. to 334 degrees Fahr. superheat and realizes 3,200 I. H. P. with a coal consumption of 1.164 lb. per I. H. P. hour. The sister ship uses 1.32 lb. coal per I. H. P. hour. The most noteworthy improvement in this case is that the Answald can get her power from three boilers, while the sister ship needs four. This enables the Answald to enlarge her bunker capacity by about 7,000 cu. ft. and to stow 160 tons more coal without encroaching upon the cargo space.

Engine for Torpedo Boat Service

A remarkably handsome engine of this type, built by works of Heinrich Lantz, in Mannheim, of 6,000 I. H. P., for torpedo boat service, was exhibited last year at the Brussels exposition.

The engine, with four cylinders, each 40 in. by 20-in. stroke—one H. P. expanding into 3 L. P.'s—by 250 R. P. M. and 240 lb. steam was shown to occupy no more space than an equal torpedo boat turbine outfit at 650 R. P. M., but being actually lighter and having a condensing outfit of 30 per cent less in weight than a turbine outfit would require.

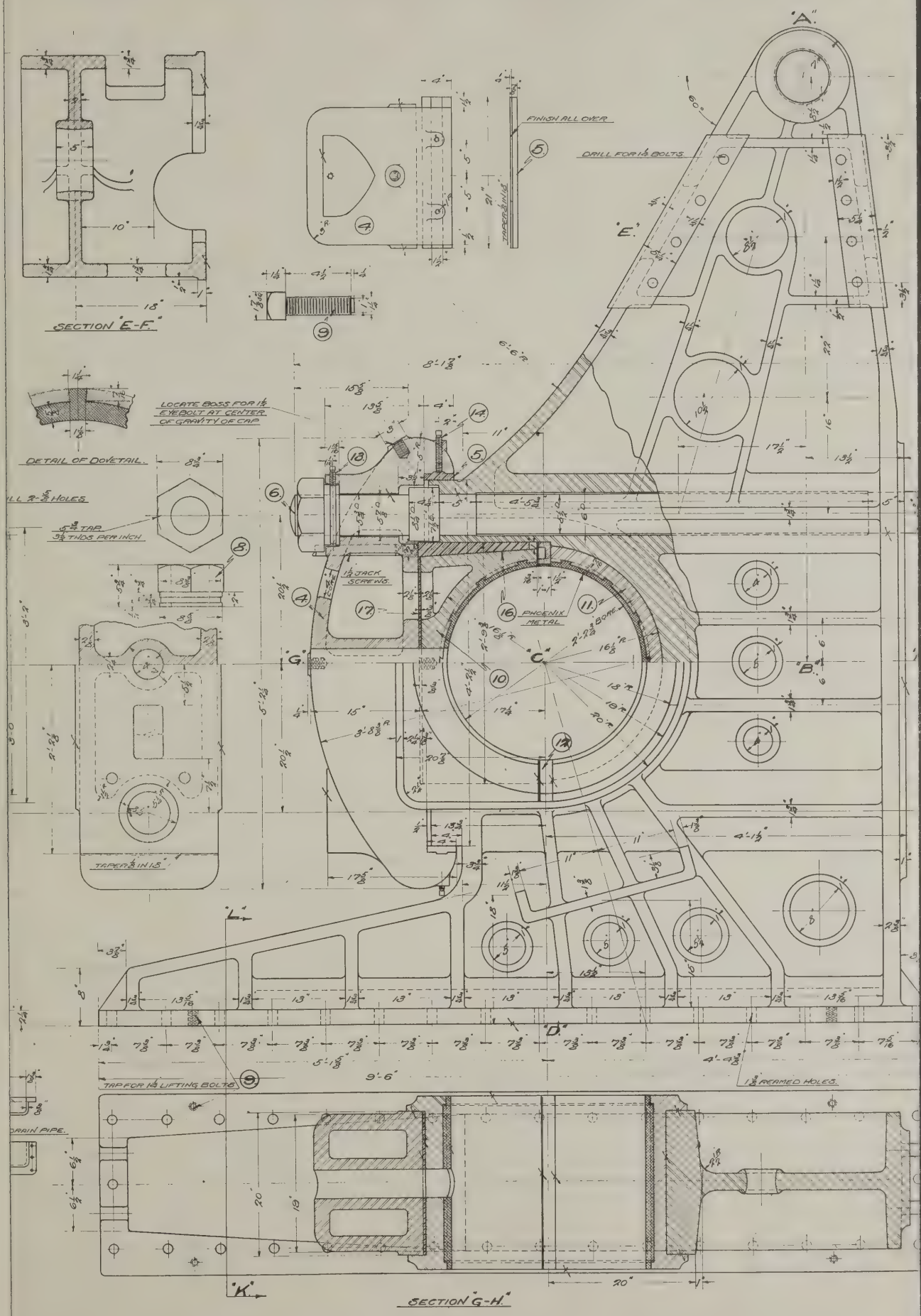
All of these performances are referred to economy in coal consumptions and the deduction lies near that it is the superheating arrangement of the boiler that produces the economy and any engine that can successfully be worked with superheated steam may be expected to show equally good results.

The German government installed a Lentz poppet valve engine in connection with Schulz water tube boilers and fitted with superheaters in the navy water tender Drache, and made quite exhaustive tests on the plant. These tests as well as other experiments with superheaters seem to indicate rather where difficulties might arise. Two points principally seem important, one concerning the boiler and one concerning the engine. For reasons of rapid heat transmission it has been found desirable and almost necessary to arrange the superheater coils where the temperature of the gases of combustion is still quite high. When, however, the engine shuts down suddenly or temporarily and when steam does not flow through the superheater rapidly, its tubes become so overheated, that it may rapidly lead to deterioration of the material and extensive repairs. This danger seems so pronounced that the Drache had the superheater arranged in a by-pass and the Yarrow Co. now proposes to by-pass the gases around the superheater, whenever steam is not flowing actively through the superheater.

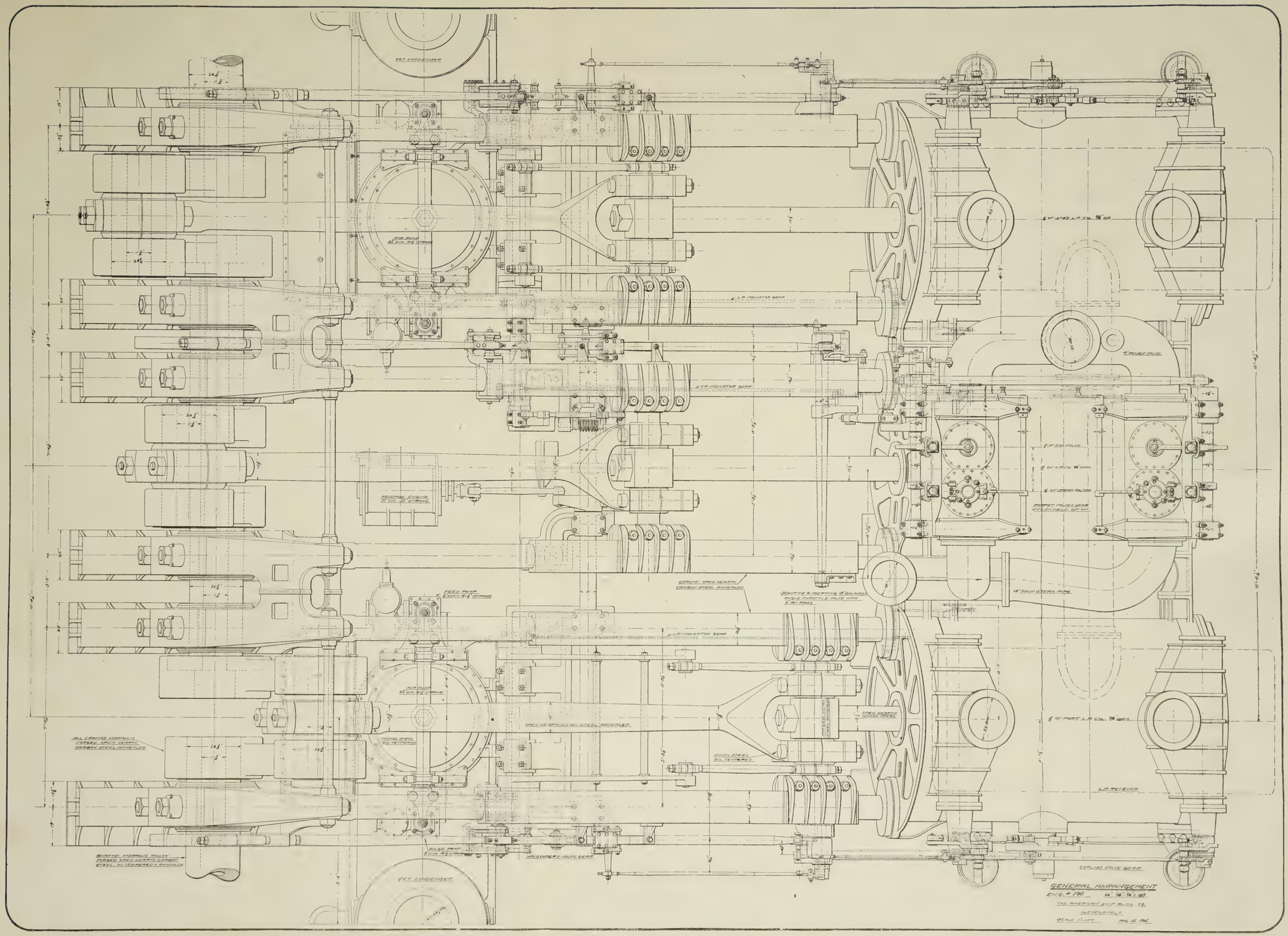
Question of Lubrication

The second point concerns the lubrication of the piston rings and of the piston rod stuffing boxes. The Lentz arrangement avoids rubbing friction in the valve mechanism, but it cannot avoid rubbing friction in the piston. The stuffing boxes are usually special designs of Lentz, after gas engine fashion with numerous intermediate recesses between packing rings of practically no pressure. Doubtless details of successful piston ring packings will be found also that can be used on all such degrees of superheat, as the material of the steam spaces can lastingly endure. The fact remains, however, that the tests of the Drache showed a limit of cylinder lubrication at about 518 degrees Fahr. steam temperature. However, the Drache is only one case, and numerous cases were cited in the discussion of the paper on Letz engines before the German society where the cylinders had successfully worked under temperature up to 750 degrees Fahr., as in the steam yacht Lensahn, of the Grand Duke of Oldenburg. The Grand Duke himself, as president of the German Society of Naval Architects, stated that he was well satisfied with the engine of his yacht, which showed an increased economy of 21 per cent in coal consumption.

The second type, while leaning somewhat upon superheating, is the uniflowing engine, which attempts to reduce initial condensation mainly by letting the steam flow always in one direction, namely from the clearance spaces at the ends with their

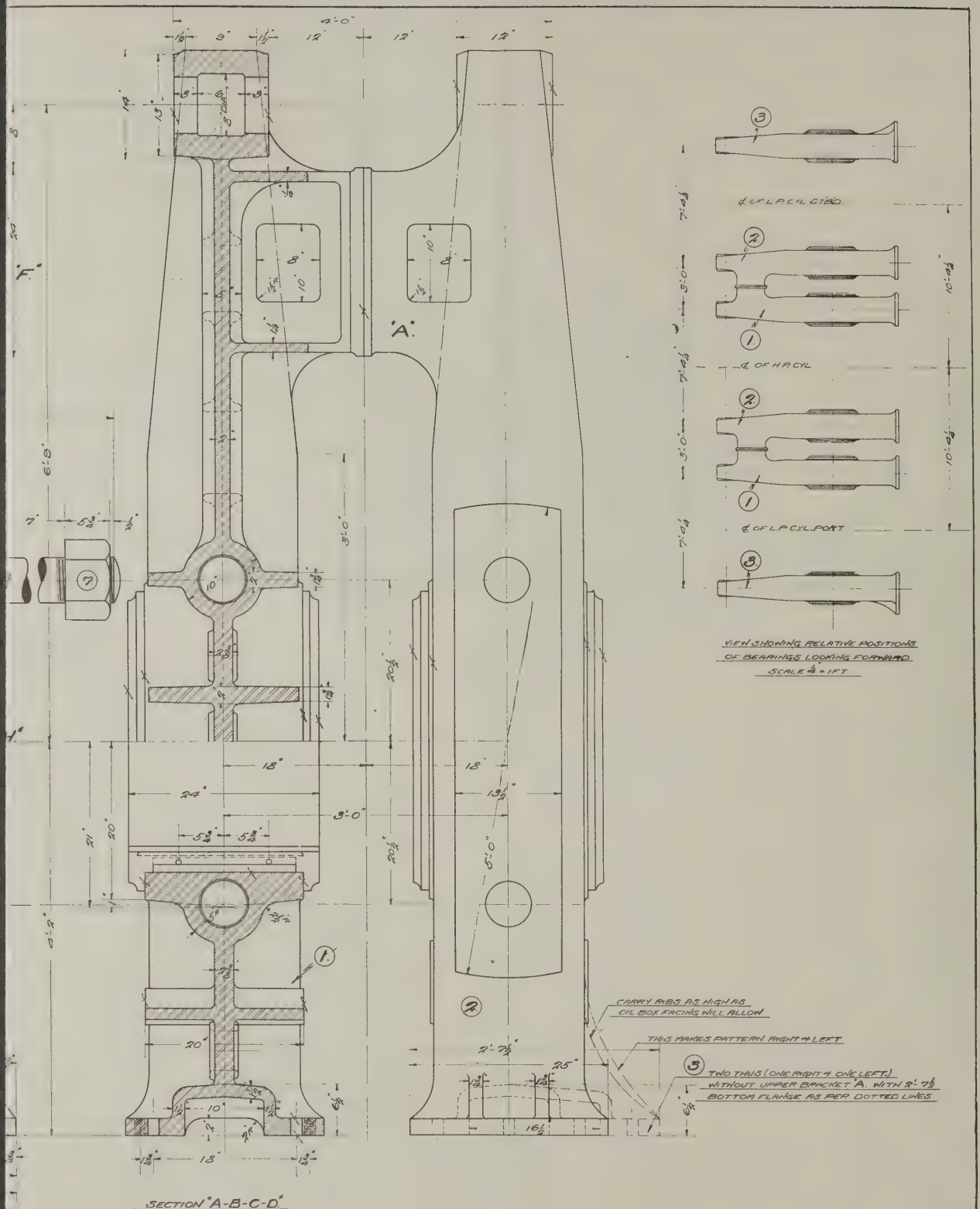


Main bearing pedestals of the engine of the Cleveland & Buffalo



General arrangement of the inclined three-cylinder engine of the Cleveland & Buffalo Transit Co.'s new steamer, See-and-Bee.

Main bearing pedestals of the engine of the Cleveland & Buffalo Transit Co.'s new steamer See-and-Bee.


SECTION "A-B-C-D"
VIEW SHOWING RELATIVE POSITIONS OF BEARINGS LOOKING FORWARD
SCALE 1/4 = 1FT
℄ OF L.P. CYL. CTRD.
℄ OF H.P. CYL.
℄ OF L.P. CYL. PORT
CARRY RIBS AS HIGH AS OIL BOX FACING WILL ALLOW
THIS MAKES PATTERN RIGHT & LEFT
TWO THUS (ONE RIGHT & ONE LEFT) WITHOUT UPPER BRACKET 'A' WITH 2'-7½ BOTTOM FLANGE AS PER DOTTED LINES

Transit Co.'s new steamer See-and-Bee.

steam admission members to the exhaust ports at the half length of the working bore of the cylinder. This carries with it a simplification in the valve gear, as the piston itself takes the task of the exhaust valve by overrunning the port, giving exhaust opening at the proper time and starting an invariable and fixed compression at a very early stage of the return stroke. This early and large permanently fixed compression proves exceedingly advantageous to economy, as it superheats the remaining steam to full admission temperature or more, and thereby checks in the most effective way the initial condensation of the incoming steam. This early and large compression has also no drawback upon the steam admission, as the piston is absolutely independent from the valve gear, which may be adjusted to the most favorable or desired steam lap, lead and cut-off. As the steam ports never have to serve as exhaust ports, they may be proportioned purely for steam speeds with the smallest possible clearance. This again contributes materially to the economy by reducing cooling surfaces and accentuating compression temperatures.

The Stumpf engine is designed with a long piston equal to the stroke minus the width of the exhaust slots. There are, however, already other engines on the European market that embody this principle of uniflow, but make the piston only of ordinary length. It can then be used as an operating member for a constant and large compression, but has to be supplemented by an extra exhaust valve over the central exhaust slots for taking care of the proper timing of the exhaust opening. This modification secures all the advantages of the first arrangement, but reduces the length of the cylinder quite materially. For marine purposes, it is more likely to be the best suited and its undoubted economy is proven by the engines built by some German locomobile works and by the stationary engines as built by the Belgian works of Kerrhove. The economies that have been realized by this type in single cylinders are remarkable.

Prof. Stumpf gives in a paper before the German Society of Naval Architects one test of a 100 H. P. single cylinder engine with a steam consumption of 11.84 lb. and 55 degrees Fahr. superheat at engine, and another test of a 500 I. H. P. single cylinder engine with a water rate of 10.12 lb. at 213 degrees Fahr. superheat. By jacket and head heating this has been reduced to about 8.8 lb. in later trials, showing the great importance of maintaining a high temperature in the admission steam. Several marine engines of the Stumpf type are under construction in German ship yards and very likely particulars and tests will be placed this winter before the German society. If these tests prove and further confirm the remarkable economy of this type of uniflow engine, it may prove of far-reaching importance for the further development of the marine reciprocating steam engine. It would seem as if it might, with oil fuel under water tube boilers of very high pressures, lead to fuel economies that nearly approach the fuel economy of the internal combustion heavy oil engine.

Points of Advantage

The principal points of advantage that might reasonably be looked for would be:

I. Simpler engines with fewer cylinders for many cases of reduced first cost and reduced cost of operation.

II. Higher steam pressures, earlier cut-offs and smaller clearances as the most vital factors of increased economy in the engine.

III. Superheating of the steam leading also to better heat utilization in the boilers.

An analysis that would be full and comprehensive enough for clear mechanical as well as commercial judgment must include besides coal consumption also special attendance, interest and depreciation over periods of years.

It is the superheating problem that is really the crux of the possibility of realizing better economy and the question arises most pronouncedly: Is superheating of the steam absolutely essential to higher economies and if so to what extent?

When the possibility of using pressures beyond 300 lb. with a saturated steam temperature of 417.4 degrees Fahr. is considered under the realization that the saturated steam temperature of 450 lb. pressure is only 456.6 degrees Fahr., or an increase of only 39.2 degrees Fahr., then the great gain of power as well as the extreme difficulty of maintaining such a pressure and temperature intact are readily apparent. The least amount of cooling in pipes or engine will send the pressure tumbling down at the most startling rate. For the maintenance of such high pressures superheating of the steam alone would seem to be able to provide that margin that could effectually prevent liquefaction of some of the steam. The tests of the Drache indicated that for normal commercial conditions steam temperatures might without undue complication be run up to 535 degrees Fahr. or even 560 degrees Fahr. Referring this to 450 lb. pressure, it would seem that superheat of 80 degrees Fahr. to 100 degrees Fahr. can readily be obtained before trouble with lubrication of cylinders, piston rings and stuffing boxes need be looked for.

Effect of Superheated Steam

Also tests of steel and iron material under temperatures up to 550 degrees Fahr. have shown that a perceptible reduction of strength or deterioration does not ordinarily occur below these temperatures.

This, however, can not be said of bronze, brass or copper, emphasizing the need for their replacement by cast or forged steel in plants employing superheated steam. Fig. 3 shows also that even for turbines, which are virtually uniflow engines, the first 50 degrees Fahr. to 100 degrees Fahr. of superheat are the most effective as avoiding the very largest share of initial or subsequent condensation. It would seem as if a superheat of 80 degrees to 100 degrees Fahr. with very careful lagging and perhaps reheating between cylinders might secure a fair preservation of temperature that would allow a theoretical comparison as exemplified in Fig. 4. It illustrates two cases that might be considered or are suitable for great lakes steamers.

A represents a case similar to a recent, highly-efficient and successful installation of current type with a quadruple-expansion engine of an extreme ratio of cylinders of 1 to 9.

B represents a hypothetical case that would attempt to produce an equal power in a plain compound of much smaller cost and weight at a consumption of superheated steam less than 60 per cent of the saturated steam used by the quadruple-expansion engine. The race for higher economies is on and owners and builders have to sift carefully and choose wisely to get the best ultimate commercial result from their marine power plants.

It would be a rash conclusion, however, to assume that one type will completely supersede another type or that the new will crowd out much of the old. The engineering experience of the world seems to point rather to a singling out of

special cases, where their characteristics offer an unusually useful field to one or the other power agent. The turbine never replaced the reciprocating engine of current economies in a great many cases and a reciprocating engine of highly increased economy might replace only few steam turbines. For example, in fire boats or dredges, where the main engines might also drive large centrifugal pumps, the turbine would seem to be an ideal motor. Also in multi-screw shallow river steamers an electrical power transmission from one non-reversible turbine to numerous reversible motors and propellers, or to auxiliaries, might prove exceedingly useful.

It is the privilege of the modern engineer to choose from so many power agents the one that will turn in highest efficiency and security the forces of nature to useful service of man.

Suction Experiments

In view of the general lack of experimental data as to the magnitude of the mutual forces involved in the causes of interaction or suction between two vessels moving in parallel paths in close proximity, and as to their effective range of action, prompted by the collision between the Olympic and the Hawke in the Solent last fall, Prof. A. H. Gibson and J. Hanney Thompson decided to carry out a series of experiments to investigate these points on boats of sufficiently large size to enable the results to be applied with some confidence to sea-going vessels. The vessels used were the steam yacht Princess Louise and a motor boat. Each is propelled by a single screw and their leading particulars are as follows:

Vessel.	Keel, ft. in.	Beam, ft. in.	Draught, ft. in.	Rudder area, sq. in.
Princess Louise..	88 6	13 0	6 for'd 7 aft.	...
Motor-boat	29 6	6 9	2 3	100

Two sets of experiments were carried out and the results have been submitted to the British Association. In the first, the helm of the motor boat was lashed amidships with the vessels on parallel paths and its behavior was noted when at different lateral distances and when the boats were moving at different absolute and relative speeds. Its position relative to the Princess Louise was determined by angular measurements taken from the latter vessel at intervals of 15 seconds. Pressures at a series of corresponding points on the two sides of a motor boat were measured at the same instant with a view to determining the lateral force involved.

The second series of experiments was devoted to a determination of the helm angle necessary to maintain the course of the motor boat when in different positions relative to the larger vessel.

Owing to possible collision risks, the maximum speed was limited to 6 knots, which, in the case of the Princess Louise, corresponds to 18 knots in a vessel the size of the Olympic. The results show that with both vessels moving at about this speed with helms amidships the smaller vessel is drawn into collision from any lateral distance less than a hundred feet—3½ lengths of the smaller vessel. The precise behavior depends largely on the relative and absolute speeds of the vessels and on their initial distance apart and initial relative position. The experiments prove conclusively that the forces involved in suction are much greater than have been generally realized hitherto. Prof. Gibson and Mr. Thompson were much impressed by the rapidity with which collision usually follows the first sign of suction.

Cargo of Cedar Posts

The accompanying photograph shows the barge Plymouth, owned by Mackinnon & Scott, Menominee, Mich., in tow of the tug James H. Martin, in Menominee river with the largest load of cedar posts ever taken into the port of Menominee. The barge carried 100,000 7-ft. posts.

THE LARGEST LOAD OF CEDAR POSTS EVER BROUGHT INTO THE MENOMINEE RIVER

Battleship New York Launched

The battleship New York was launched on Oct. 30 at the New York navy yard. She is a sister ship of the Texas, building at the yard of the Newport News Ship Building & Dry Dock Co., which was launched on May 12. The launching of the New York was distinguished in the fact that the president of the United States attended. The New York is 573 ft. long 95 ft. beam, having a displacement with all stores and ammunition aboard of 28,367 tons. Her estimated horsepower is 28,100 and designed speed, 21 knots. Her battery will consist of ten 14-inch guns and 21 5-inch rapid fire guns.

Sidelight on Earnings

An interesting sidelight on earnings at sea has just come out on the claim of the dependents of the second-class barber on board the Titanic for damages under the workmen's compensation act. The barber received the nominal wage of a shilling a month from the company, but his earnings were as follows: From shaving, $42; from haircutting, $11.50; from shampooing, $12.50; from tips, $7.50 to $10, and from trading in toilet articles, $47.50, a total of $121.00 for the trip. Contrast these figures with what a stoker gets. In addition, of course, the barber gets his board and lodging free.

In September there were built or building 224 vessels on the Isherwood system with a total tonnage exceeding 1,000,000. Seventy-five of the vessels, with a total tonnage of 392,000 tons, are oil tankers. Of the total tonnage now under construction in the various parts of the world for carrying oil, nearly 76 per cent is on the Isherwood system and to classification in Lloyd's Register.

Launch of the Frieda

There was launched on Saturday, Oct. 26, from the yards of the Fore River Shipbuilding Co., at Quincy, Mass., the bulk cargo steamer Frieda, to the order of the Union Sulphur Co., from the designs of George Simpson, naval architect, New York City. The vessel was christened by Miss Adeline H. Snider, daughter of Clarence N. Snider, the treasurer of the Union Sulphur Co.

This vessel is 315 ft. in length and of 5,000 tons deadweight on a moderate draught. The Frieda has been designed especially for the transport of bulk cargoes of low density and for this reason there has been incorporated in her hull, topside and also athwartship ballast tanks, on the Simpson principle, making the holds self-trimming on all four sides, thereby more than doubling her ballast capacity and reducing her tonnage 20 per cent.

The hull has been built to the highest class in Lloyds Register, on what is known as modified transverse framing.

The vessel is of the single deck, poop, bridge and forecastle type with propelling machinery installed aft and is rigged with three pole masts, the fore and main having derricks and cargo discharging gear.

The accommodations comprise separate state rooms for the captain and navigating officers, together with two guests' rooms in the bridge house amidships. The engineers are quartered in a commodious Liverpool house on the poop deck, and the petty officers, seamen, wipers, etc., in wing houses at the forward end of the poop deck. These accommodations will be exceptionally comfortable and go far to establish the superiority of the quarters allotted to American seamen.

The auxiliary machinery comprises a Hyde windlass and steam capstan, Lidgerwood winches and steam steering gear with telemotor.

The equipment of the Frieda is up-to-date in every respect, and consists in addition to the usual articles, a submarine signal, wireless telegraph installation, Morse night signal and a porhydrometer for the automatic weighing of the cargo.

The propelling machinery consists of a 22½ in. triple-expansion engine with two large single-ended Scotch boilers with Howden's forced draft and fitted for burning liquid fuel.

There has been installed in the engine room duplicate sets of 10 kilowatt generators; also two half-ton capacity ice machines to take care of the crew's consumable stores.

THE FRIEDA, OF THE UNION SULPHUR CO.'S FLEET
From a sketch furnished by the Fore River Shipbuilding Co.

The North Atlantic Fleet

When the Atlantic fleet passed in review before the president of the United States, Oct. 15, it carried out to sea no less than 269 machines of the Providence and Williamson make, of which 187 were on twenty-five of the thirty-one battleships in the fleet. Fifty of the ships, including twenty-two battleships, were steered by Williamson steering engines. There were twenty-six Providence windlasses, thirty-one winches and hoists, and fourteen capstans on various vessels. Twenty-five of the ships carried 105 ash hoists, of which eighty-eight were on eighteen battleships. The Wyoming and Florida carried three sets of coaling gears; there were twenty-one ammunition hoists, fourteen boat cranes and five of the famous Providence towing machines.

Most noteworthy of all of these items was the great preponderance of Williamson steering engines on the battleship and armored cruiser fleet, for out of thirty-five vessels no less than twenty-five were controlled by these machines. As practically every case represented was based upon case represented was based upon prev previous experience with the machines, it is perfectly clear that the United States government has the utmost faith in the product of the American Engineering Co., of Philadelphia.

The Bluefields Fruit & Steamship Co. has been organized under the laws of Louisiana to engage in the growing and transportation of bananas and other fruits. The company was formed to take over the property and holdings of the Bluefields Steamship Co. The headquarters of the new company will probably be in New Orleans.

The Dominion government has given an order to Thornycroft & Co., Southampton, Eng., for a customs patrol steamer for service in the Gulf of St. Lawrence, to be 185 ft. long and 32 ft. beam, and will be equipped with two sets of triple-expansion engines driving twin screws. The contract price is stated to be about $275,000.

Isherwood Construction System III

In Which the Author Explains How to Get the Sheer of the Vessel

By Robert Curr

IN THE present article, which is the third of the series, the author explains how to get the sheer of the vessel.

Plate 3. shows the sheer line, deck line on half breadth plan and beam camber. It is necessary to have these three plans in order to run in the sheer lines at side and center.

The sheer line shown here is the line at side and is obtained by dividing the length 203 ft. into eight parts: Four in each body, as shown by ⅛, ¼, ⅜ and ½. The line A B is drawn parallel to the base line on the lowest point of the sheer. The lines ⅛, ¼, ⅜ and ½ are erected perpendicular to same at points giving eight divisions on line A B.

The perpendicular nearest both ends: ⅛ is 55 per cent of the sheer, ¼, 26 per cent, ⅜, 7 per cent and ½, zero.

Example:—

The length of the line A B is 203 ft.: Dividing A B by eighths, it gives 25.375 ft. The half length is marked one half and is on the lowest point of the sheer. The first division from the fore end is marked one-eighth and by setting up 55 per cent of the sheer on this perpendicular, we have 55 per cent of 39 inches, which equals 22.45 inches.

At the second division 50.75 from the fore end we have 26 per cent of 39 inches, which is equal to 10.14 inches.

At the third division 76.125 from the fore end we have 7 per cent of 39 inches, which is equal to 2.73 inches.

Measuring from aft we have 11.55 for the first section, 5.46 for second section, and 1.47 for third section. By holding a batten to these points we obtain the sheer as shown on plan.

The sheer at center can not be obtained by this method and the beam camber must be referred to. If by running a line on the same method here described, it would be found flat, and the beams at ends would have to be made flatter than at amidships.

The next thing to be considered is the width of the deck at side. In this case the deck is 39 ft. wide; in the middle 104 ft. is straight, leaving 43 ft. forward and 56 ft. aft to be faired up.

The half breadth plan shown here, shows three lines, the center line running fore and aft, transverses dotted, lying at right angles to the center line, and the curved line the deck. The sheer line at side and deck width has now been fixed. To get in the line at center, on the sheer plan, it is necessary to refer to the beam camber; as shown here on a larger scale than the other two plans. This camber is shown the full width of the deck of vessel, and the transverses are numbered on it. The camber is 10 in. in 39 ft., and from No. 7 to 24 is the same width; making the ship side at deck straight for over 100 ft. and parallel to the center line.

The line A B is drawn in at right angles to the center line C, and the deck widths 1, 2, 3, 4, 5, 6 and 7 in the fore body, and 24, 25, 26, 27, 28, 29, 30, 31 and transome in the after body, are transferred from the half breadth plan to same. From the line A B the points of half widths are dropped down to the beam camber, and the distance between same is the height of sheer at center above the line at side.

In the designing of the vessel the lines are generally named to suit circumstances. The dotted lines shown here in the sheer and half breadth plans are termed stations when considering displacement, and are arranged differently.

In the meantime I am considering construction for which any lines may be used. The lines in these plans numbered 1 to 31 are transverses and are not likely to be changed in the working plans. The transverses are spaced 6.16 ft. apart. The measurement given in the last article was an error.

The finding of the points for the sheer requires the same process as for fairing up the transverses and level lines. The fairing up of the cross sections and level lines being more tedious and taking longer to secure the fairness. The fairing up of the cross and horizontal sections is done firstly by approximately running in the level lines in the half breadth plan; a sort of free hand process. These lines are transferred to the buttock and bow lines on the sheer plan, then to the body plan, corrections are made until the three plans agree, after which the lines are considered fair.

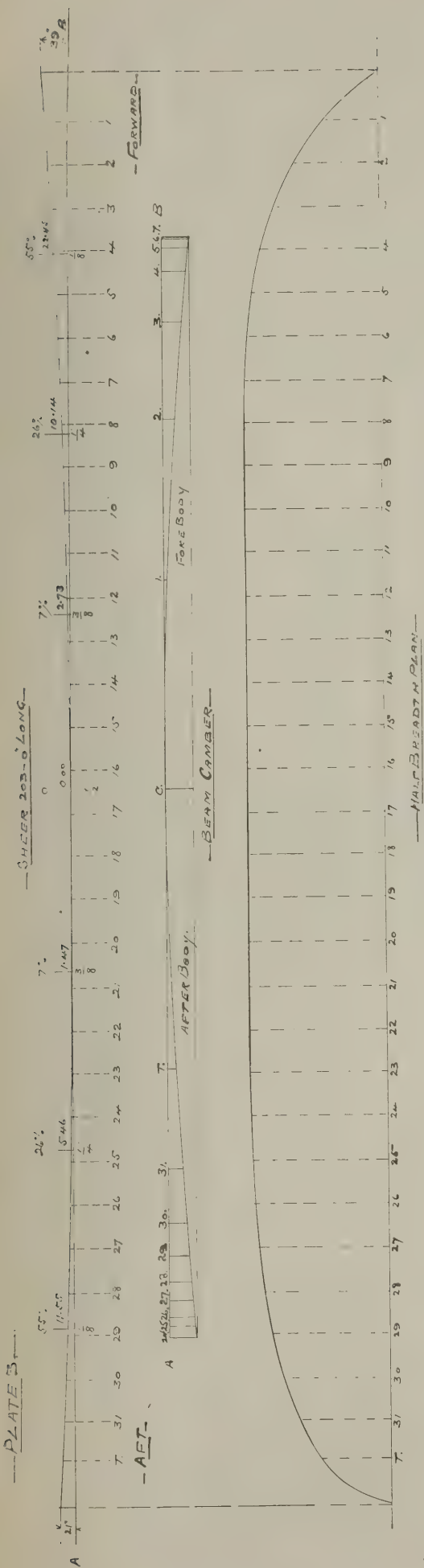
As has been already explained, a bilge diagonal line is run in as a further test of fairness. In the Isherwood construction the longitudinal frames serve as diagonals, and when they have been proven fair, little doubt will be left in the matter of fairness.

Judge Lovett on the Panama Canal

Judge Robert S. Lovett, head of the Harriman Railway System, is of the opinion that the Pacific northwest will be the only part of the United States to derive material benefit from the Panama canal. He argues that the canal will mean a heavy immigration into Washington and Oregon, which will result in greatly developing that part of the country. He does not believe that the Panama canal will disturb freight rates to any extent.

"Of course," he said, "the railroads may lose some of the long haul business, for some of the trans-continental business which is now routed over land will likely go via the canal, but I hold that this fundamental principle will remain true after the canal is open, that is: Whatever is of advantage and benefit to the country at large, will be of benefit to the railroads. As the communities are built up by population flowing in through the canal, the railroads will have more local business to handle, for each new settler will be a producer, and will furnish business for the railroads."

He does not believe the passenger business will develop through the canal so rapidly, or the service be as good, as it would have been if the railroads had been permitted to operate steamship lines through the canal. His argument is that it would cost about $20,000,000 to construct such a fleet as the Pacific Mail Steamship Co. had in mind, and he does not think that any private interest is going to spend that amount of money right away to provide passenger accommodations.



SHOWING THE SHEER LINE, DECK LINE ON HALF BREADTH PLAN AND BEAM CAMBER ISHERWOOD SYSTEM OF CONSTRUCTION

Items of General Interest

The Merrill-Stevens Engineering Co., Jacksonville, Fla., has received contract from the Jacksonville Ferry Co. for a steel ferry boat for river service.

The Maine Central railroad has given contract to the Bath Iron Works, Bath, Me., for a twin screw steel steamer 194 ft. long, 36 ft. beam and 14½ ft. deep.

The four vessels which Cramps, Philadelphia, are building for W. R. Grace & Co., of New York, will be named Santa Cruz, Santa Catalina, Santa Clara and Santa Cecelia.

The amount of the check given to the White Star Line by the underwriters for the loss of the Titanic was $4,500,000, the biggest check that has ever been drawn for one loss.

The steamer building at the yard of the New York Ship Building Co., Camden, N. J., for the Pacific Coast Steamship Co. of Seattle will be named Congress.

In consequence of a new law in Russia granting bounties to shipbuilders for merchant ships built within the Russian empire, several British firms are taking steps to acquire shipyards in the Baltic and on the Black sea.

Attorney General Wickersham has directed the New York Ship Building Co. to observe an eight-hour day in construction work upon the battleship Oklahoma, and accordingly the mechanics are working on that basis.

The Coastwise Transportation Co. of Boston has sold the six-masted schooner William L. Douglass to the Sun Oil Co. She will be converted into an oil barge at Cramps, Philadelphia.

The Matson Navigation Co. has given contract to the Newport News Ship Building & Dry Dock Co. for a new steamer to be a practical duplicate of the Durline for passenger and freight service.

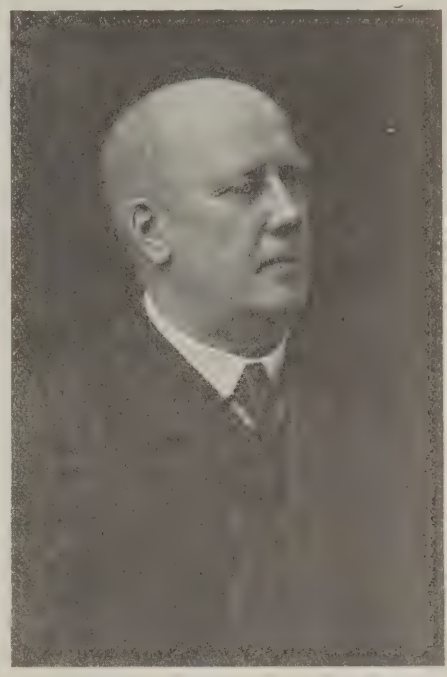
The Merrill-Stevens Co., Jacksonville, Fla., has received contract from the Clyde Steamship Co. to build a steamer for its St. Johns River service. The new steamer will be of steel and will be 187 ft. long and 42 ft. beam.

The Philadelphia & Reading railway, which has modern ore handling facilities on its docks at Port Richmond, contemplates modernizing pier 18 along lines similar to the coal piers at Norfolk, Va. It is the intention to equip the pier with car dumping machinery.

The New London Marine Iron Works, New London, Conn., is building a ferry boat, for the towns of Glastonbury and Rocky Hill, Conn.

Obituary

W. B. Davock, for many years identified with lake trade, died at his home in Cleveland, on Sunday, Nov. 3. His death was sudden and came as a great shock to his associates. Mr. Davock was born in Buffalo on July 4, 1846, and settled in Cleveland in the early 70's as a pig iron and ore broker. He later formed a partnership with John N. Glidden under the firm name of Davock & Glidden, and



W. B. DAVOCK

when this firm was dissolved, in 1879, Mr. Davock entered the employ of H. H. Brown & Co., in charge of the pig iron and iron ore departments. In 1890, he took charge of the firm's vessel property, continuing in that connection until his retirement about two years ago. He also managed the lake interests of W. P. Snyder, of Pittsburgh, under the title of the Shenango Steamship Co. Mr. Davock was a director of the Cleveland Folding Machine Co.

William Horace Corbin, vice president of the Joseph Dixon Crucible Co., died on Sept. 25.

R. W. Curtis, at one time chief engineer of the steamer B. F. Jones, and last year assistant engineer of the Steamer North West, died at Toledo, Sept. 17. Mr. Curtis was well known along the lakes.

Samuel H. Cramp, the son of Wm. Cramp, who founded Cramp's shipyard at Philadelphia, died at his home in that city on Nov. 3, at the age of 79 years. He relinquished the management of the Cramp yard about 15 years ago.

Wreck of W. C. Moreland

The after portion of the steamer W. C. Moreland, which was wrecked off Eagle river, Lake Superior, two years ago, was raised by Capt. James Reid, wrecker, after repeated attempts, successfully bulkheaded and finally taken to Detroit, where she was placed in the Ecorse dock of the Great Lakes Engineering Works. The accompanying photograph is a graphic picture of the wreck as she appeared in the St. Marys river. A survey in the dry dock showed that her bottom is pretty badly damaged. The underwriters offered her for sale, but all the bids received were rejected and new proposals will be solicited, but probably not before spring. Capt. James Reid who has a two-third equity in her will meanwhile act as caretaker.

AFTER PART OF THE W. C. MORELAND, ELEVEN HATCHES IN ALL

October Ore Shipments

Ore shipments during October were 7,010,219 tons, making the total movement to Nov. 1, 43,348,601 tons, thus exceeding the record movement of 1910, when the fleet moved 42,620,201 tons, and still with a month's navigation to spare. It will be recalled that the ore movement slumped severely during the fall of 1909, so that a better criterion of what the fleet is capable of doing in heavy weather is obtained from the November movement in 1909. During that month the fleet moved 4,899,220 tons, and it is pretty certain to move an equivalent or even greater amount during the present month, unless weather conditions should be unusually bad. The total movement for the present year will in all probability be in excess of 48,000,000 tons. In fact, it may be nearer 49,000,000 tons than 48,000,000. It is, therefore, clear that the long dreamed of movement of 50,000,000 tons per annum is about to be realized. It will undoubtedly be achieved in 1913, unless the general state of industry receives a severe set-back.

Shipments by ports were as follows:

Port.	October, 1911.	October, 1912.
Escanaba	677,807	652,894
Marquette	387,436	514,753
Ashland	381.595	759,716
Superior	1,368,893	2.002,767
Duluth	956,342	1,686,324
Two Harbors	997,892	1,393,765
Total	4,769,965	7,010,219
1912 increase		2,240,254

Port.	To Nov. 1, 1911.	To Nov. 1, 1912.
Escanaba	3,764.654	4,663,879
Marquette	1,956,147	3,082,331
Ashland	2,260,381	4,382,877
Superior	9.315,002	13,100,043
Duluth	6.457,706	9,415,511
Two Harbors	5,853,212	8,703,960
Total	29,607,102	43,348,601
1912 increase		13,741,499

Personals

Capt. W. W. Stewart has resigned the position of United States local inspector of hulls at Port Huron.

Harvey D. Goulder, general counsel for the Lake Carriers' Association, has just returned from Europe.

J. F. McCarthy, of Cleveland, has been appointed assistant manager of the lake shipping and fuel department of the Pittsburgh Coal Co.

William K. Kavanaugh, of St. Louis, has been re-elected president of the Lakes to the Gulf Deep Waterway Association.

Rear Admiral Lucien Young, commandant of the naval station at Key West, Fla., died suddenly at the Waldorf-Astoria, New York, on Oct. 3.

Dr. Carl Buenz, the new general representative of the Hamburg-American Line, appointed to succeed the late Emil L. Boas, reached New York on Oct. 3.

H. E. Moore, general freight agent of the Tehuantepec railroad, has resigned to become traffic manager of the Atlantic & Pacific Steamship Co., organized by W. R. Grace & Co.

Calvin Austin, president of the Eastern Steamship Corporation of Boston, recently inspected the Cape Cod canal and believes that it will cut down the steaming time of vessels between New York and Boston by three hours.

Commerce of Lake Superior

The commerce of Lake Superior during October as measured by the traffic passing through the canals at Sault Ste. Marie amounted to 10,716,-791 net tons, making the fifth month in which the commerce has exceeded the 10,000,000-ton mark. The October movement is even greater than that of September, and was only slightly exceeded by the movement of any month since June, certainly a very surprising thing. The total movement to Nov. 1 is 62,669,499 tons as against 47,359,739 tons for the corresponding period during 1911, an increase of 15,309,760 tons. Following is the summary:

	To Nov. 1, 1911.	To Nov. 1, 1912.
EAST BOUND.		
Copper, net tons	104,444	89,988
Grain, other than wheat, bushels	27,021,695	38,256,754
Building stone, net tons	4,367	2,282
Flour, barrels	5,944,766	6,782,396
Iron ore, net tons	28,227,583	42,171,157
Pig iron, net tons	32,905	19,087
Lumber, M. ft. B. M.	485.876	577,794
Wheat, bushels	60,929,021	111,636,750
Unclassified freight, net tons	121,349	203,624
Passengers, number	36,904	31,341
WEST BOUND.		
Coal, anthracite, net tons	1,769,567	1,682,355
Coal, bituminous, net tons	11,894,878	10,937,040
Flour, barrels	125	
Grain, bushels	1,350	100
Mfrd. iron, net tons	320.314	523,373
Iron ore, net tons	15,758	6,660
Salt, barrels	550,778	566,487
Unclassified freight, net tons	1,046,575	1,181,047
Passengers, number	41,042	33,794
SUMMARY OF TOTAL MOVEMENT.		
East bound, net tons	32 230,708	48,254,518
West bound, net tons	15,129,031	14,414,981
	47,359.739	62,669,499

The total number of passages to Nov. 1, 1912, was 19,898, and the net registered tonnage, 49,703,464.

The Howard Shipyards Co., Jeffersonville, Ind., has been taken over by the Howard Shipyards & Dock Co., the incorporators being E. J. Howard, Clyde Howard, James E. Howard, James H. Armstrong and M. Z. Stannard, all of Jeffersonville. The capital stock has been increased to $800,000.

Cramps, Philadelphia, has received the contract from the navy department to build the gunboat Sacramento on its bid of $492,500.

Received from Uncle Sam

WAR DEPARTMENT

OFFICE OF THE QUARTERMASTER GENERAL
WASHINGTON

Goldschmidt Thermit Co. (381551) August 30, 1912
90 West St., New York, N. Y.

Gentlemen:

1. Replying to your letter of August 26th, 1912, you are informed that the welded stern post of the steamer "Gen. Nathaniel Greene," which you repaired for this department at New London, Conn., in 1907, is still in service on that vessel and giving satisfactory results.

2. It is the general policy of this Department to not permit the publishing of any official reports upon commercial products or processes, but in this particular case there would appear to be no objection to your use of the foregoing statement of fact regarding the continued use during the past five years of the stern frame welded by you. By direction. Respectfully,

(Signed) WILLIAM E. HORTON,
Major, Quartermaster Corps, U. S. Army

We feel confident that the above letter, the original of which we can show, is enough evidence to prove the permanency of a "Thermit Weld."

Our welding process has received the sanction of the British Corporation for the Survey and Registry of Shipping, Glasgow.

Our Pamphlet No. 25-E and "Reactions" will interest you. Shall we send them?

THERMIT

GOLDSCHMIDT THERMIT COMPANY
WILLIAM C. CUNTZ, Gen. Mgr.
90 West St., New York

432-436 Folsom St., San Francisco
103 Richmond St., W., Toronto, Ont.
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The Babcock & Wilcox Co.

NEW YORK and LONDON

Forged Steel

Marine Water-Tube Boilers

and

Superheaters

for

Naval Vessels **Merchant Steamers**
Ferry Boats **Yachts and Dredges**

These boilers hold the record for economy, capacity and endurance in the Navies of the World.

They have shown the same characteristics in the Merchant Marine. Babcock & Wilcox Boilers and Superheaters in one vessel are *saving more than 15 per cent.* over Scotch boilers in sister vessels.

Is a reduction in your coal bill of any interest to you?

Babcock & Wilcox Boilers have all essential parts heavier than corresponding parts in Scotch boilers, giving greater security against corrosion. They are lighter, safer, easier to clean and to operate than Scotch boilers, and much more efficient.

We are constantly receiving "repeat orders" from owners of merchant vessels who have had many years' satisfaction from the earlier installations.

Write us for details

OAKUM

W. O. D. & S.

On a Bale of Oakum

INSURES QUALITY

Grades—Best, U. S. Navy, and Navy, both Spun and Unspun.

Also Plumbers' Oakum and Spun Cotton.

Give us an opportunity to show you the quality of our goods.

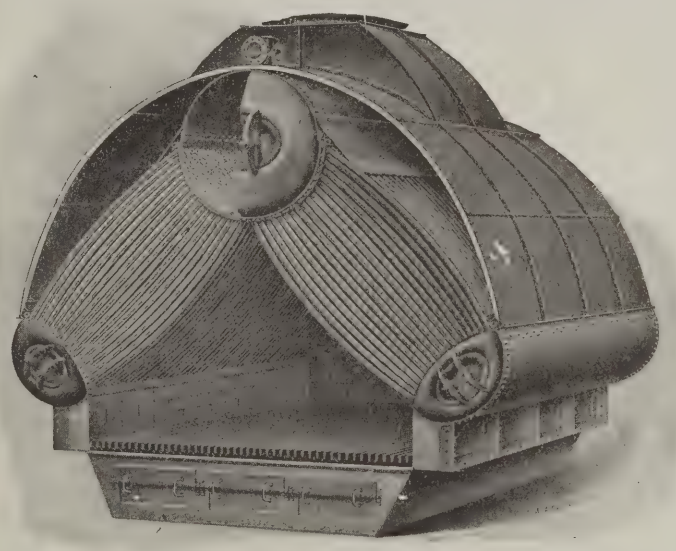
We were established in 1840, and for over 70 years have been doing a business that has been made possible only by "Square Dealing".

"Quality, First, Last, Always"
IS OUR MOTTO

Let us hear from you at once.

W. O. DAVEY & SONS
JERSEY CITY N.J.

Mosher Water Tube Boilers



Adapted for the highest grade service, Torpedo Boats, Destroyers, Battleships, and large commercial vessels. Steam drums up to six feet in diameter, larger water and steam room capacity than any other boiler.

Any tube can be replaced without disturbing any others. Fifty tubes removed through one hand-hole. Curvature of tubes just sufficient to avoid expansion troubles. Greatest facility for cleaning interior and exterior of tubes. No screwed joints, all tubes expanded. All parts of wrought steel. Send for catalogue.

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New Hocking Valley Docks at Toledo

Bids will be opened by William Michael, chief engineer of the Hocking Valley Railroad Co. in Columbus, on Nov. 11, for the construction of concrete coal and ore docks, slips and winding basin at the Hocking Valley's new terminal at Toledo. The company contemplates altogether an expenditure of about $2,000,000 at the terminal, though of course a great part of this amount will be expended in eliminating grades, in erecting viaducts and extensive trackage facilities.

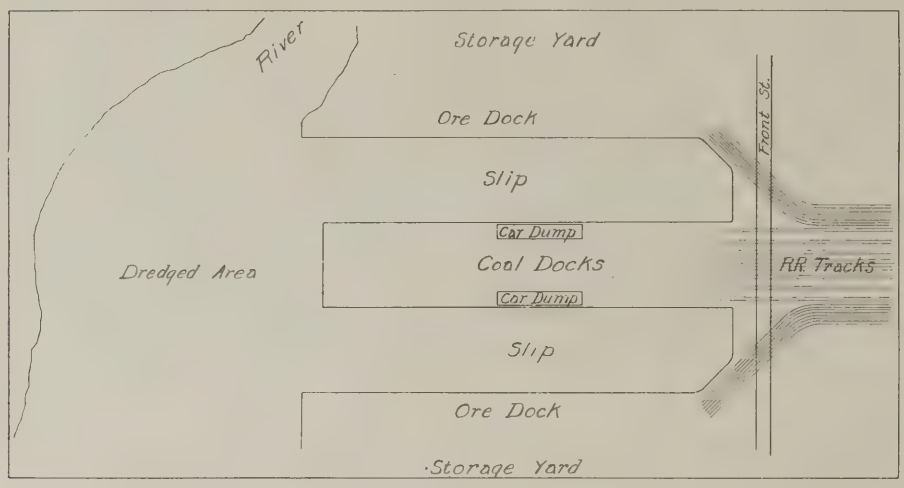


DIAGRAM OF HOCKING VALLEY RAILWAY IMPROVEMENTS AT TOLEDO

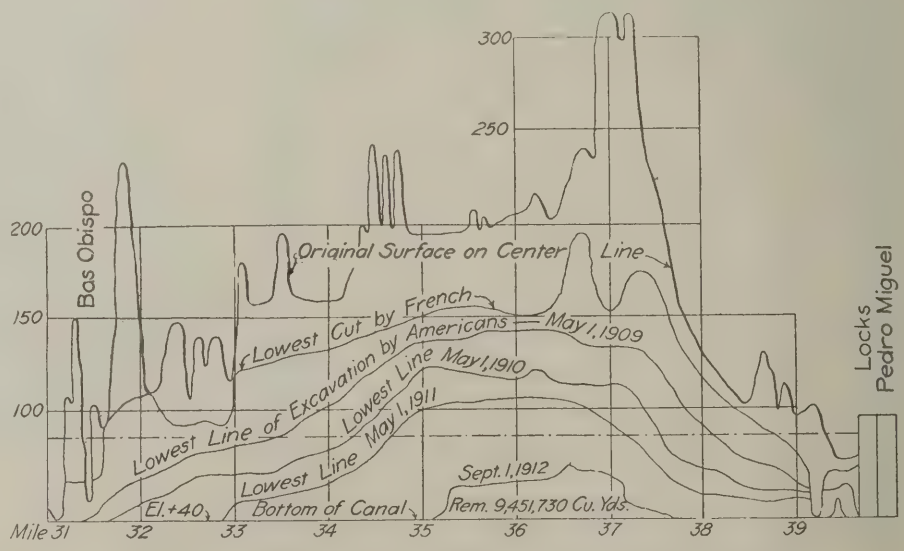
In order to carry out the improvements the city council of Toledo has vacated Front street and the traffic at this point hereafter be cared for by a viaduct. When the improvements are completed the coal trade of the Norfolk & Western railroad will be diverted from Sandusky to Toledo. The Hocking Valley now handles 2,500,000 tons annually at Toledo, but the new coal dock will have capacity for about 5,000,000 tons. The coal dock will have water approach on both sides, the face of the dock being 877 ft. long, and will be equipped with two car dumps. The two ore docks will also have an equivalent water front. The specifications call for a concrete wall on pile construction 1,700 ft. long and 2,000 ft. of cribbed dock construction, the cribs being 26 ft. deep and 37 ft. wide, made of 2-inch material. The crib work will have a superstructure 15 ft. deep and 9 ft. wide of concrete. The work calls for 400,000 yards of dredging, 3,000,000 ft. board measure of timber in the cribs, 21,000 yards of concrete and 143,000 lineal feet of piling. The dredged area is to have a depth of 23 ft. below mean lake level. The general arrangement of the yard is shown in the accompanying sketch.

Work on Culebra Cut

Work on the Culebra cut of the Panama canal is progressing rapidly and at the present rate of progress the excavation work will be completed in five months. Up to Oct. 1, 85,400,000 cu. yds. of material had been removed from the cut. The amount removed during September was 2,124,440 cu. yds. as against 2,443,353 cu. yds. in August, which had the advantage of three working days over September. The estimate of 2,000,000 cu. yds. per month is therefore a fair one, so that by March 1, all excavation work upon the cut should be completed. Practically all of the excavating remaining to be done lies within a distance of about five miles between the new bridge at Paraiso and Lapita Slide. The accompanying profile shows very clearly the earth yet to be removed.

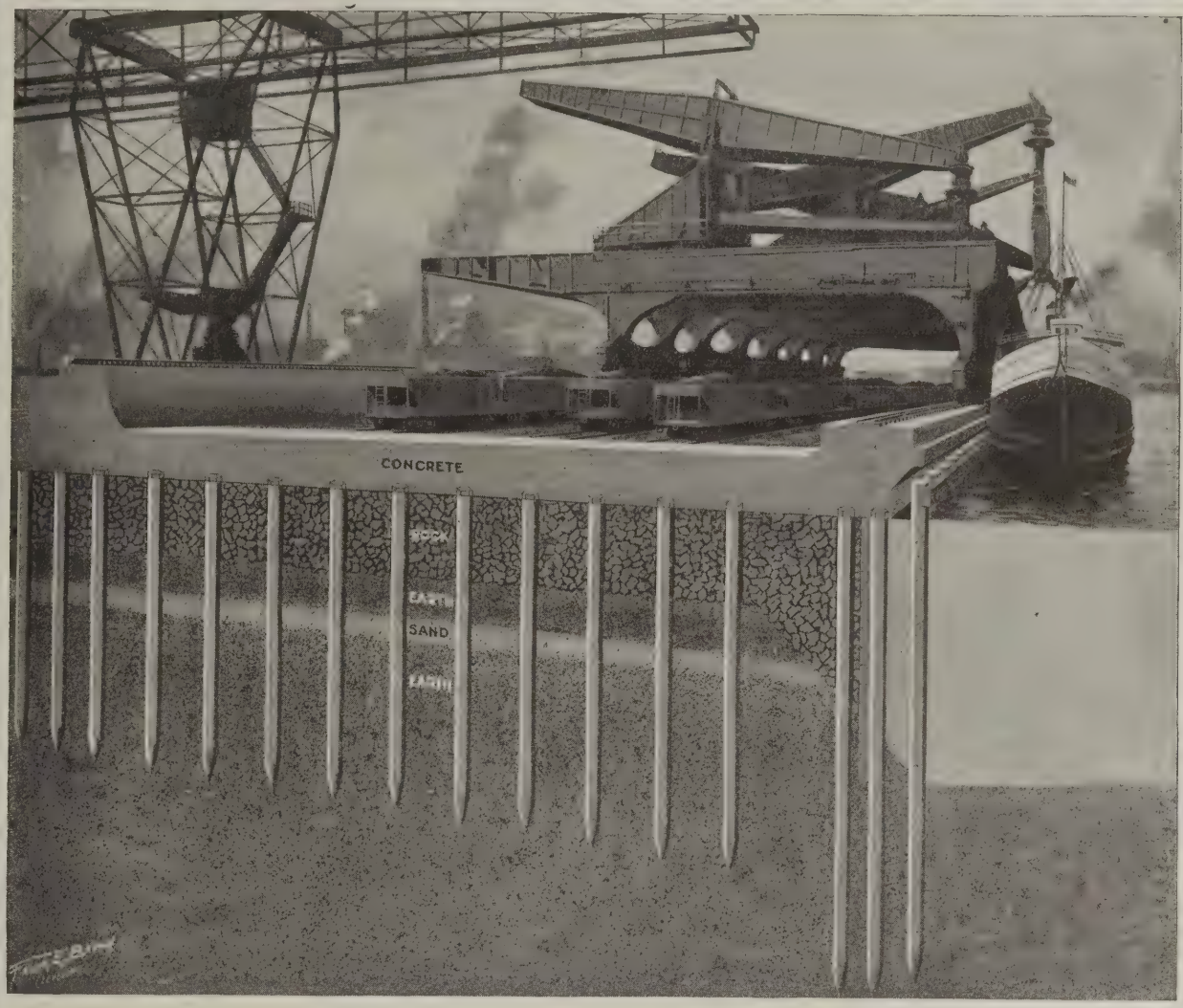
The elevation, however, is not altogether a complete index of the amount of work to be done because of breaks and slides along the embankments. Over 20,000,000 cu. yds. has already been taken out of slides and about 45 per cent of the excavating remaining to be done is due to them. Because the development and extent of slides cannot be accurately estimated, excavation through the cut will be prosecuted with vigor to obviate contingencies. The number of steam shovels at work, which has averaged about 37 since the beginning of the present raining season, is shortly to be increased to 41 or 42. The government has placed July 1, 1913, as the date for finishing the dry excavation, which is a liberal allowance.

As soon as the excavating is completed, water will be let into the cut through the dyke at Gamboa and the ladder dredge Corozal is to be brought into the cut from the Pacific entrance to work at the foot of any slides which continue to develop, in addition to removing the dyke and cleaning out about 150,000 cu. yds. of silting in the completed channel between Gamboa and Mamei. The slides call for no other treatment than unremitting excavation. The plan of excavating at the top, however, has reduced the size of the slides and restricted their menace. It is planned to open the canal to commerce on Oct. 1, 1913.



PROFILE OF CULEBRA CUT, SHOWING PROGRESS OF EXCAVATION

Gilbert Anderson announces his removal to 1025 West North avenue, corner Hawthorne avenue, Chicago. His shipyard will be located at the north end of the canal, one block east of North avenue bridge.



The construction features of this immense ore dock in the outer harbor at Cleveland mark an epoch in American dock design.

The off-shore site of the dock was covered by from 6 to 20 ft. of water. The bottom of Lake Erie at this point was soft clay. A fill made of steel-mill and railroad refuse was made to bring the grade to about 5 ft. above the level of the lake.

More than 5000 pre-molded concrete piles were driven to provide a foundation for the dock walls, the great ore-handling machines, ore piles, power house and auxiliary structures.

The soft bottom would have required a vastly greater number of timber piles. And in many places timber piles could not have been driven through the fill.

Our method of casting concrete piles vertically and curing them properly, enabled us to drive these thousands of piles with no failures.

The speed with which this work was done also is noteworthy. Construction was started on March 11, 1910, and on March 11, 1911, the ore-handling machinery was in service.

Our long and greatly varied experience on substructure work of every class enables us to meet difficult conditions such as this job presented. We are prepared to handle reinforced concrete pile work anywhere. We are in a position to advise on substructure plans or to execute plans already prepared.

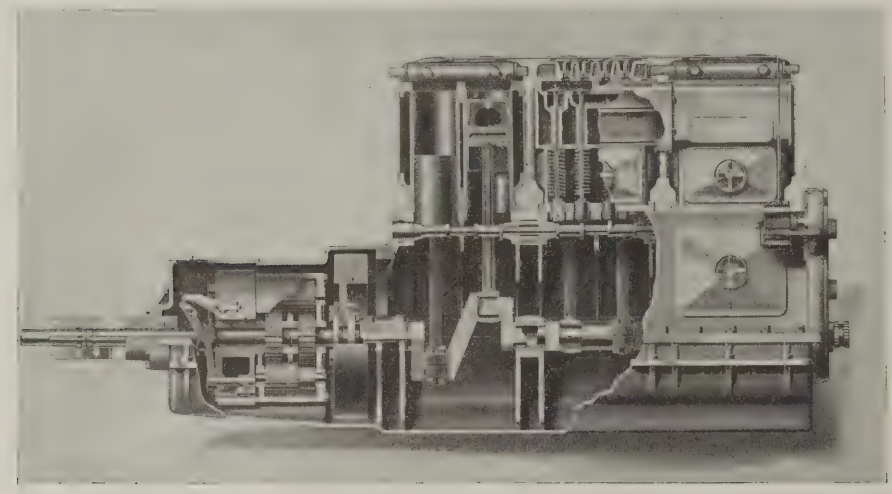
We are organized and equipped to do submarine and pneumatic work of all kinds, river and harbor improvements, dredging, pile driving, foundations, bridges, piers, breakwaters, lighthouses and tunnels.

We are operating in all the harbors on the Great Lakes, with offices in Chicago, Cleveland, Duluth, Sault Ste. Marie, Gary, Buffalo and Amherstburg, Ontario, Canada. Also on the New England Coast, with an office in Boston.

GREAT LAKES DREDGE & DOCK COMPANY

Winton Heavy Duty Marine Engine

The Winton Gas Engine & Manufacturing Co., of Cleveland, intend to put on the market in 1913 a new line of heavy duty marine engines which has been designed under the personal supervision of Alexander Winton. The new line is the fruition of several years' experimentation by the Winton organization in endeavoring to develop a heavy duty engine suitable for either pleasure yachts or commercial boats where reliability, economy, and simplicity of operation are essential. As soon as the company was satisfied with the results, work was started on the erection of a factory to be devoted exclusively to marine power plant manufacture. This plant is now completed and ready for operation and competent authorities declare it to be the most modern of its kind in the country. Everything in it is new and every mechanical facility for the manufacture of gasoline engines of large horsepower in quantities has been installed.



SECTIONAL VIEW OF THE NEW WINTON SIX-CYLINDER, HEAVY DUTY MARINE ENGINE.

The engine design of the new Winton product is of marked simplicity, the exterior being free of the piping and gear, generally so prominent. Accessibility was considered essential and, while all parts are enclosed, the coverings can be easily removed. The cylinders are cast in pairs and ground to mirror smoothness. The cylinder heads are separate castings in which the water intake and outlet is integral. The fuel and exhaust manifolds are cast with the cylinders. Strength and durability is apparent in every part. The connecting rods are steel forgings strong enough to withstand double the strain which they are subjected to. The crankshafts are of chrome vanadium steel, one-half the cylinder bore in diameter. Bearings are of white brass. Throughout the entire construction the aim has been to use the best materials in sufficient quantities to insure long life. A dual ignition system comprising two waterproof magnetos, two spark plugs to each cylinder, is used. An unusual feature is the method of lubrication. Oil is distributed under pressure by a gear pump, to the various bearings, after which it passes through a combined cooler and filter and is again circulated. The same oil used over and over in such an automatic way, not only obviates the necessity of caring for it, but the expense as well.

Horsepower ratings are very conservative, being based on the power developed at normal speed. However, the construction is such that 15 to 25 per cent greater speed can be attained with resultant increase in horsepower development without danger of strain. Regulation is obtained by a centrifugal governor operating on the constant mixture volume throttling principle and can be adjusted for increased or decreased speed.

The company is working on two six-cylinder sizes at the present time, viz.: 6-in. bore, and 9-in. stroke, 75 H. P., 600 revolutions per minute, 9-in. bore and 14-in. stroke, 150 H. P., 350 revolutions per minute. Larger sizes will be added in the near future.

It is also understood that they intend to furnish to purchasers of their engines, an outfit, at reasonable cost, comprising air compressor for starting purposes, generator for lighting and other uses, bilge pump, and the operating power for the set, a small six-cylinder engine, the engine and accessories to be mounted on one base for convenience and space economy.

Selandia's Consumption of Oil

As the consumption of oil is a very important feature in connection with the motor vessel, the following particulars of the Selandia's consumption of this fuel may be of interest. The subjoined table gives some of the worst and some of the best days, and the average speed for the different distances on the outward and the homeward voyage. The weather, especially on the homeward voyage, was anything but favorable, yet oil consumption and speed remained fairly stable; and it is interesting to note that the oil consumption has gone down almost 2 tons per day from the commencement of the trip to its finish. A steamer would have used three to four times as much coal.

OUTWARD VOYAGE.

	Consumption of oil per day in tons.	Speed, knots.
March 11, 1912: The Atlantic; heavy sea; vessel works hard, taking much water over.....	9.8	9.2
March 13, 1912: The Atlantic; vessel rolls, and takes much water over	10.2	10.4
March 14, 1912: The Atlantic; no special weather report.....	10.0	11.5
March 22, 1912; Mediterranean; no special weather report.....	10.1	12.7
March 25 to April 6, 1912; Suez to Colombo; no special weather report; average	10.0	11.5
April 9, 1912; no special weather report; average	9.6	12.4
April 8 to 11, 1912; Colombo-Penang; no special weather report; average	9.6	11.5
April 13, 1912; Penang-Bangkok; no special weather report; average	9.6	11.7

HOMEWARD VOYAGE.

May 11 to 16, 1912: Penang-Colombo; heavy, contrary sea; average	8.8	9.6
May 18 to June 1, 1912: Colombo-Suez; three days' heavy contrary sea, vessel working hard, taking much water over	8.7	10.0
June 2 to 8, 1912: Port Said-Genoa; no weather report; average	8.7	10.4
June 10 to 19, 1912: Genoa-Dover; heavy contrary sea and weather	8.4	9.6
June 19 to 22, 1912; Dover-Aarhus; no weather report...	8.0	10.3

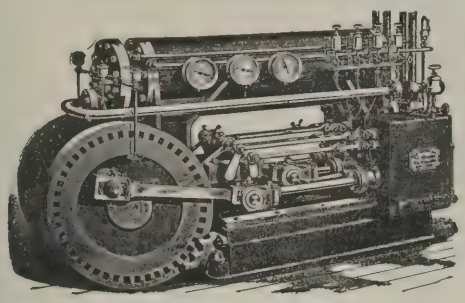
The success of the Selandia and her sister-ship, sold to the Hamburg-Amerika Line, has brought their builders, Messrs. Burmeister and Wain, several orders, and they now have orders for nine motor-vessels, of an aggregate tonnage of 40,000 tons gross, whilst their orders for steamers is confined to one—a screw boat.

May Extend Piers

The war department has decided to permit the steamship companies docking at Hoboken to extend their piers to 1,000 ft. in order to accommodate the great vessels that are now building for the New York service. Both the Hamburg-American Line and North German Lloyd are building vessels that approach 1,000 ft. in length, and the present piers are unable to accommodate them.

The Allen Dense-Air Ice Machine

contains no chemicals. It is placed in the engine room, while the ice-making box and meat rooms are at distant places of the steamer.



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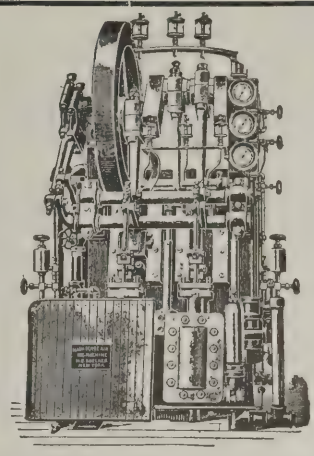

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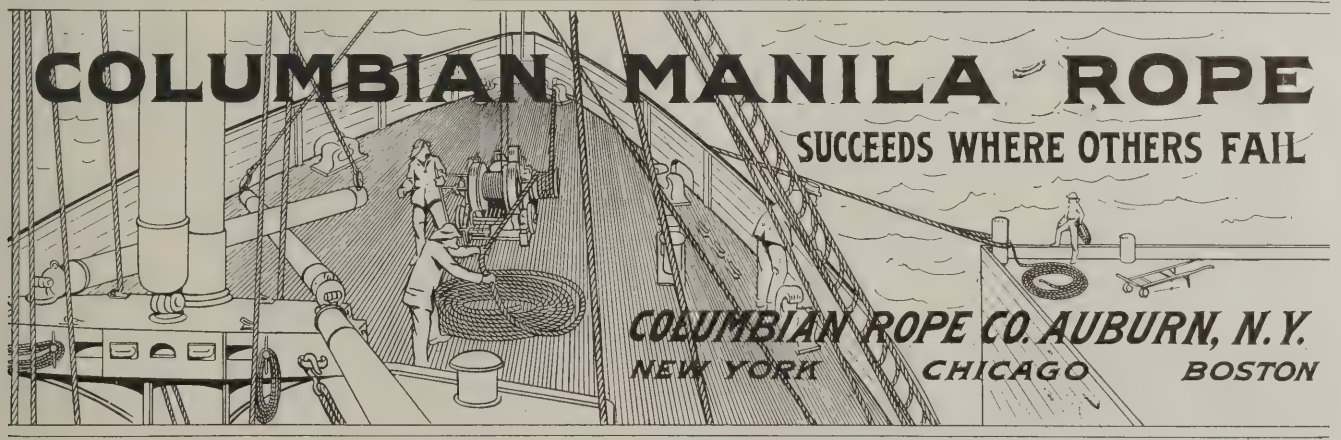

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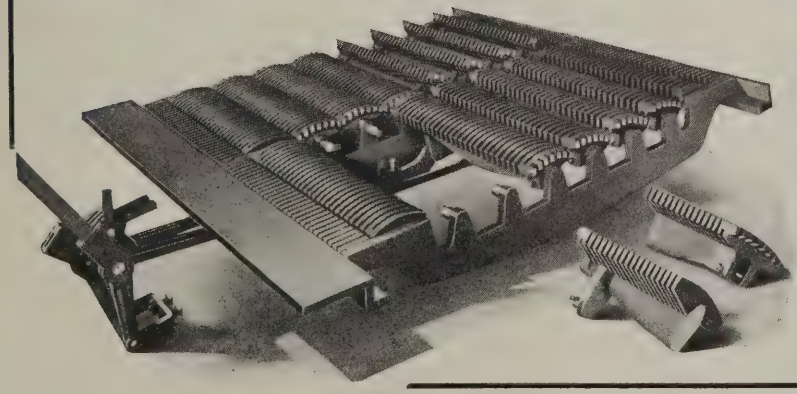

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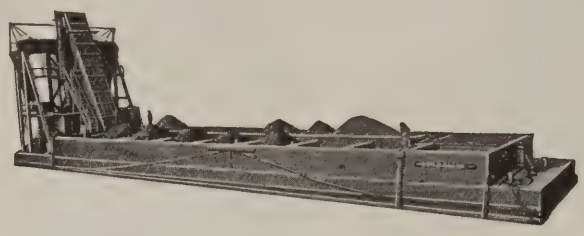

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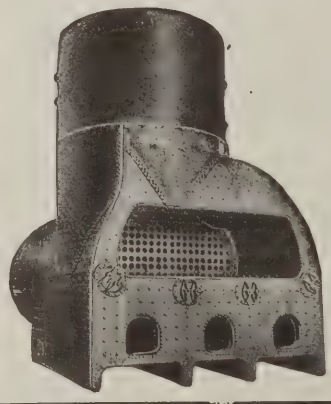

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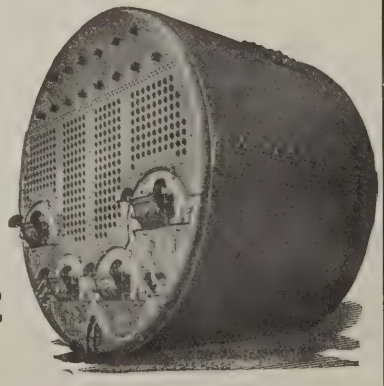

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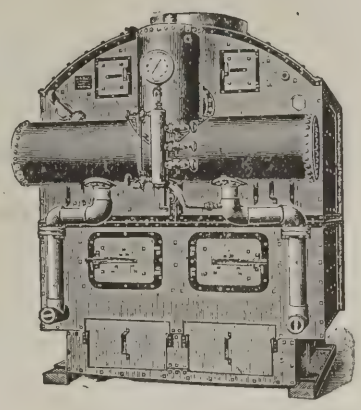

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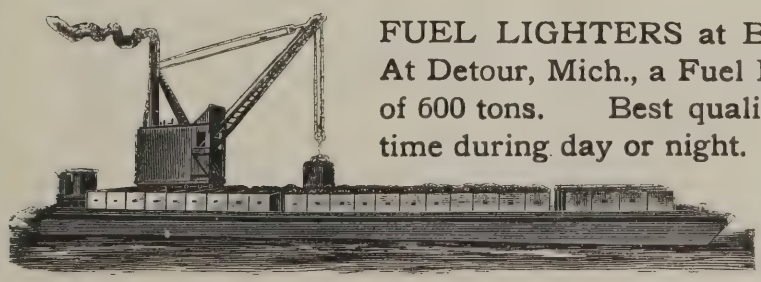

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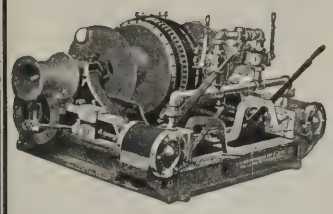

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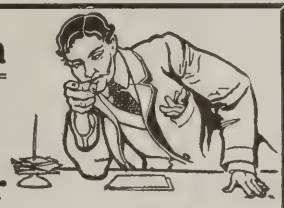

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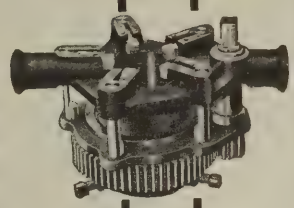

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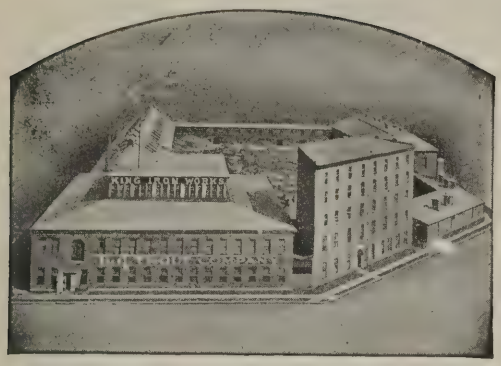

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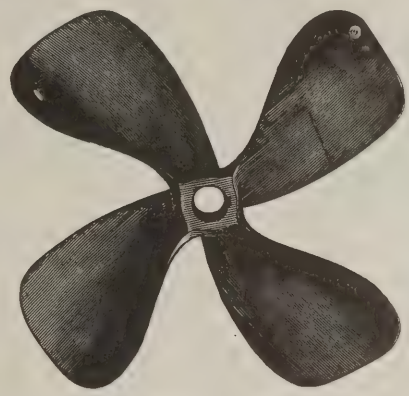

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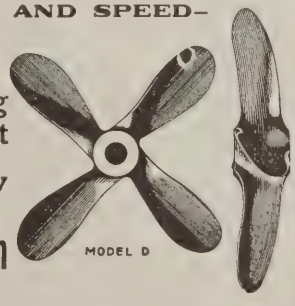

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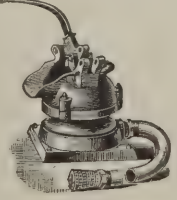

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of anything marine.

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for any kind of a position whatever in the marine field.

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if you are capable of filling a position of trust in this industry.

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for anything marine.

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One inch space, single column, $1.00.

No advertisement published for less than 50 cents.

Cash must accompany order, as the amounts are too small to permit of opening accounts.

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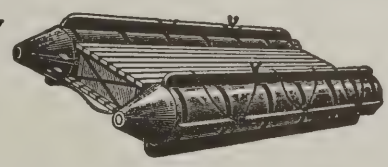

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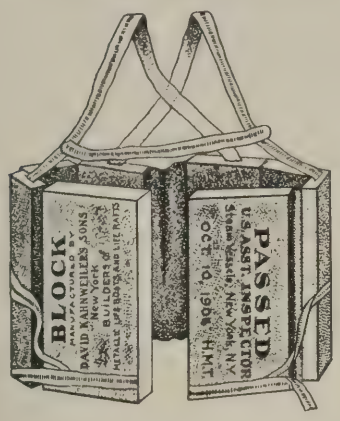

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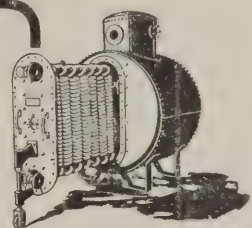

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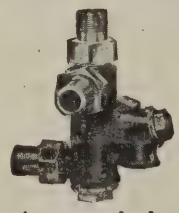

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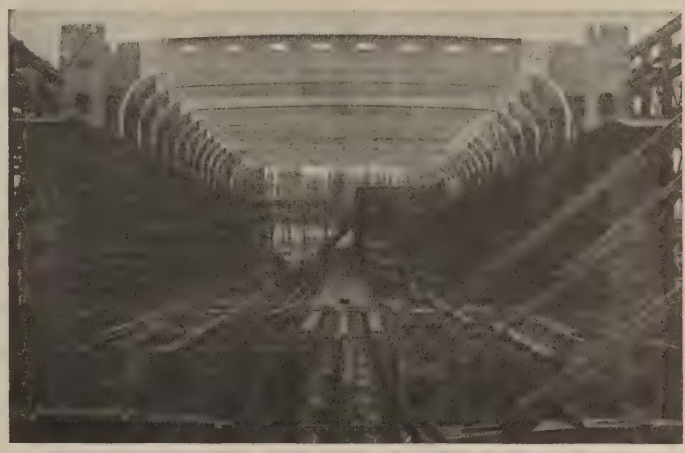

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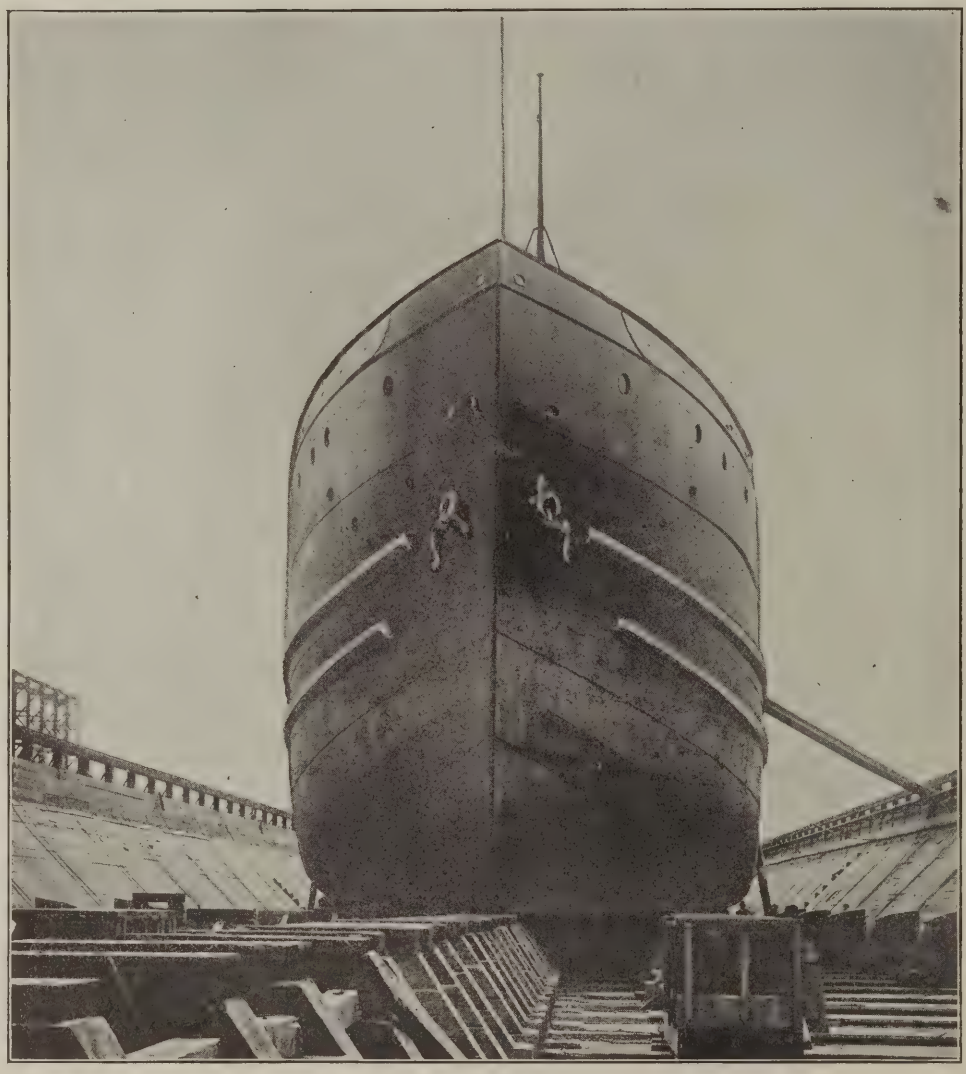

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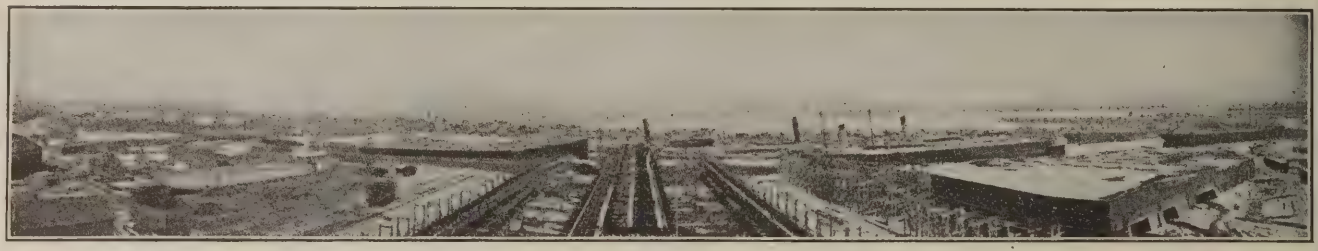

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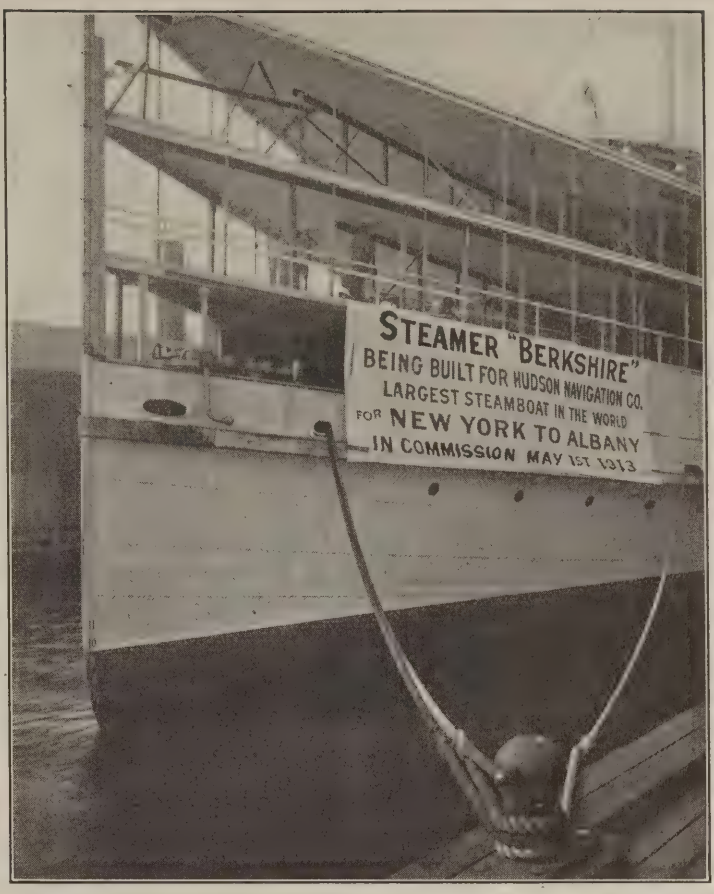
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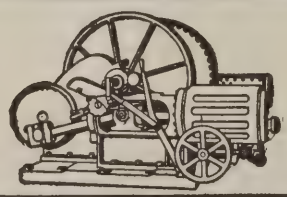

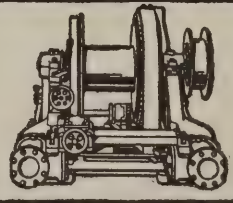

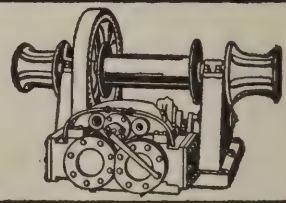

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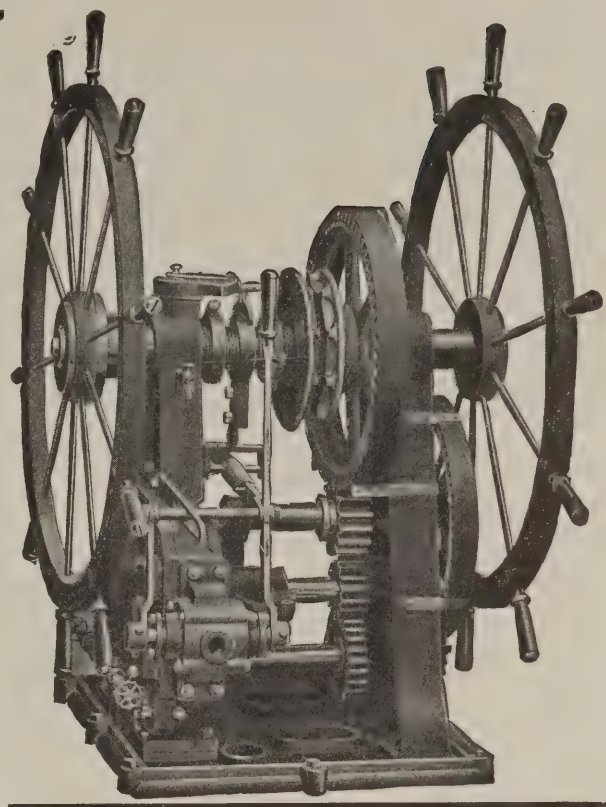

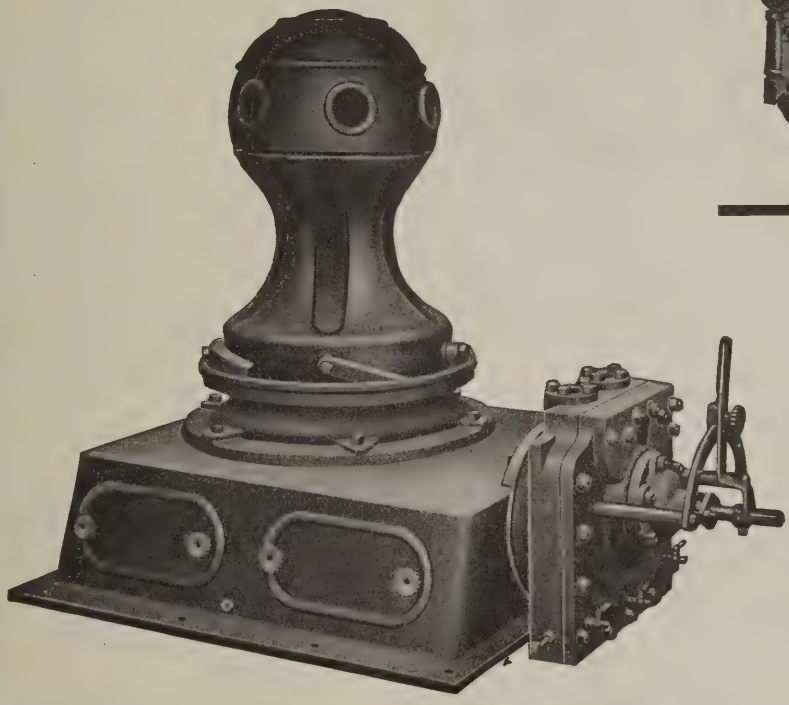

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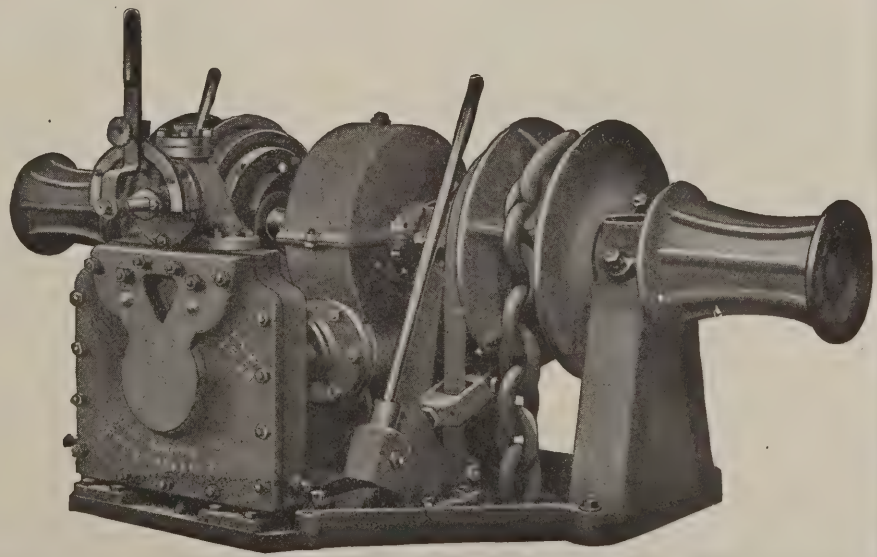

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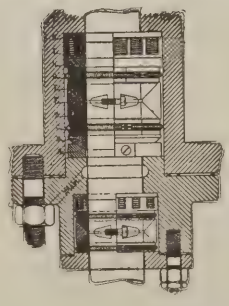

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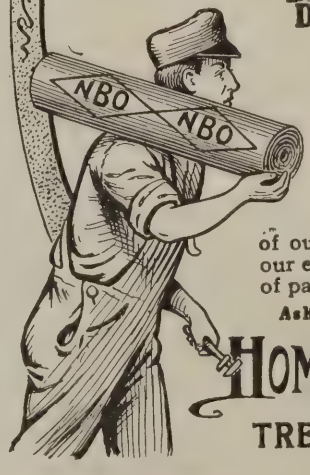

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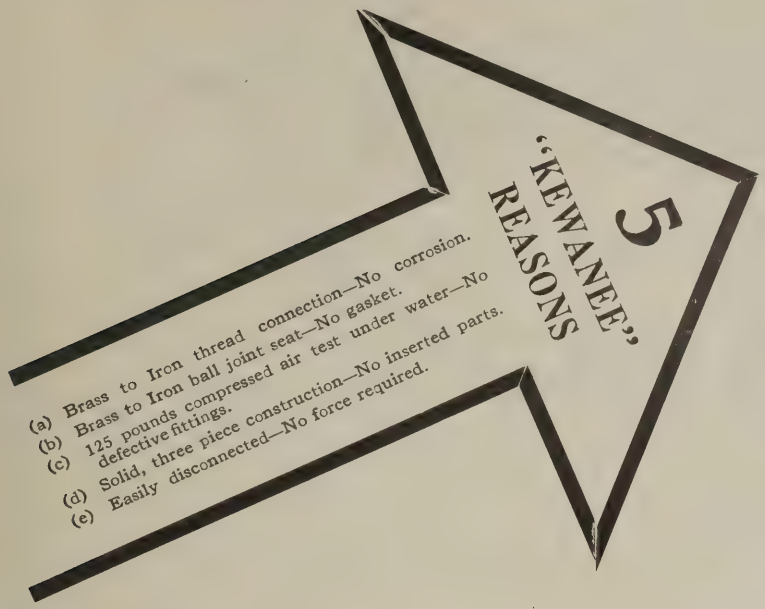
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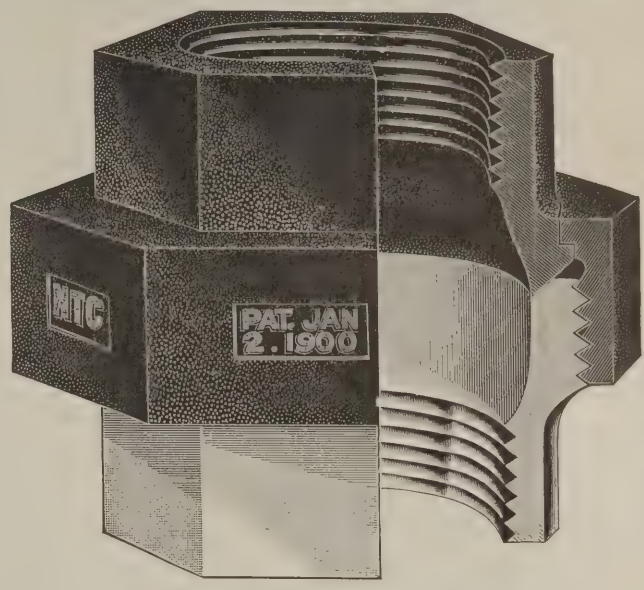

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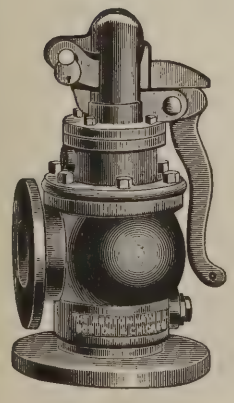

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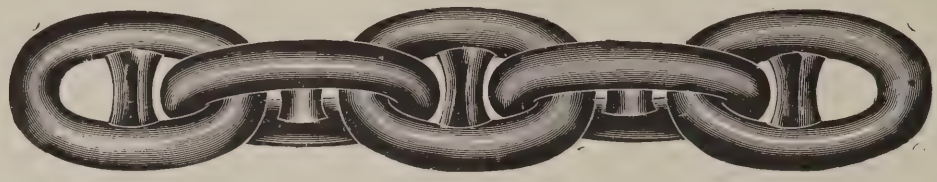

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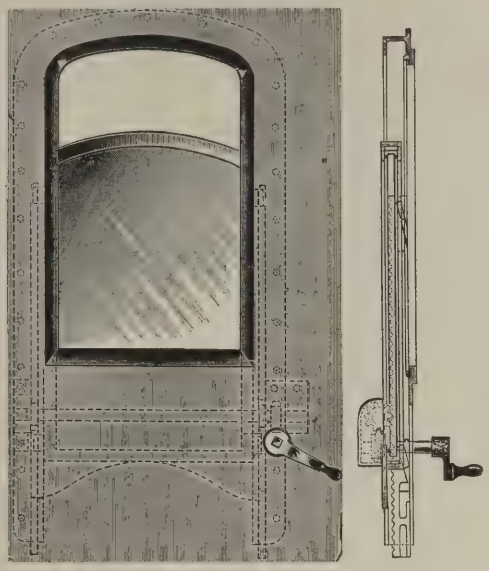

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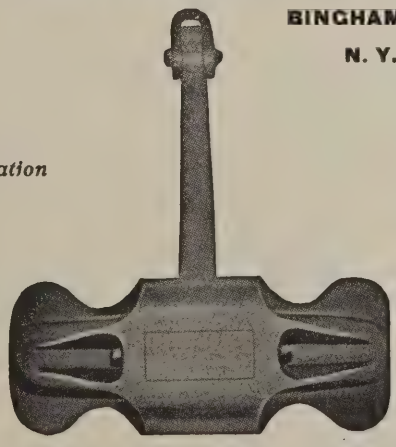

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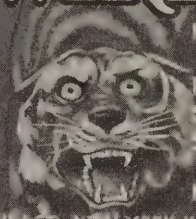

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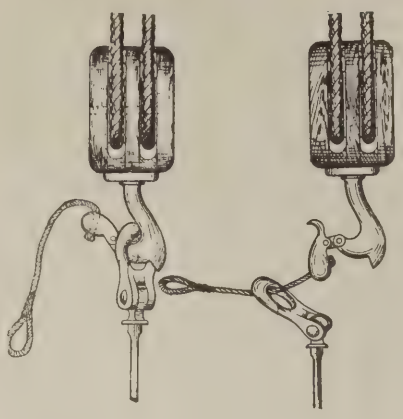

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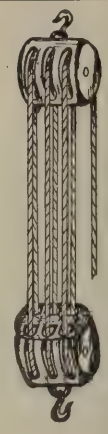

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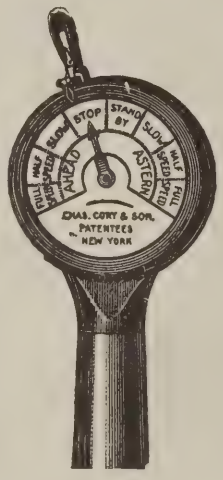

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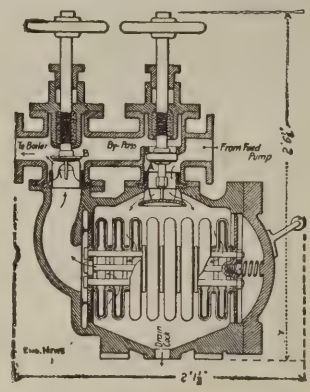

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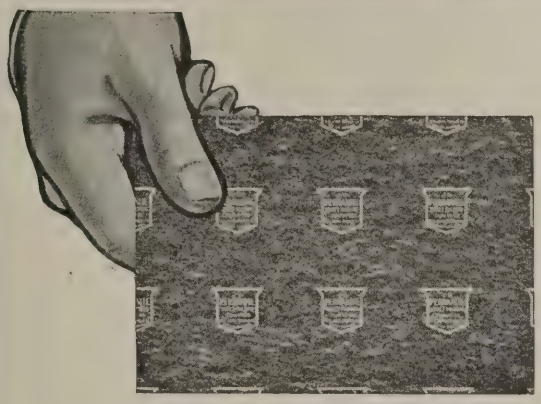

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No Live Manufacturer can afford to miss this great opportunity of insuring an increased business for 1913.

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The Marine Review
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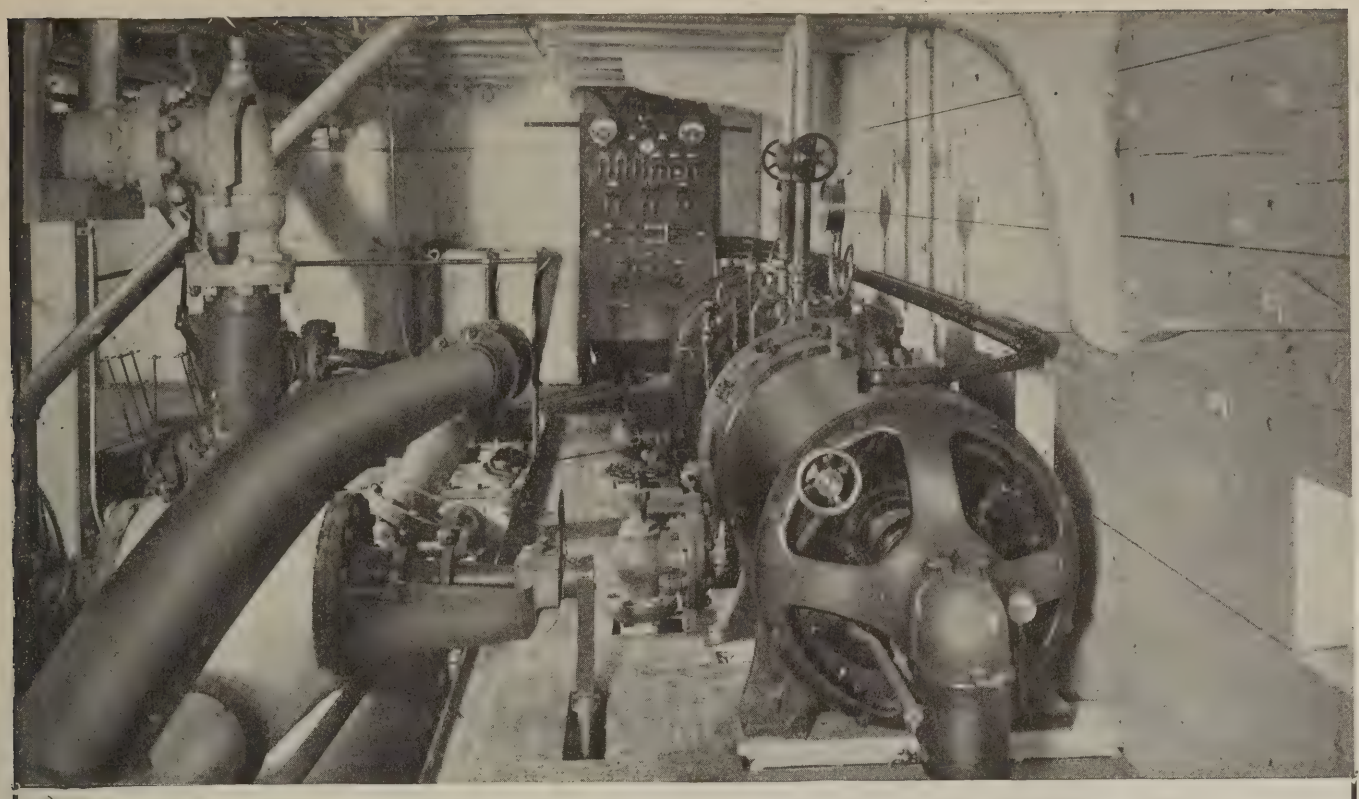

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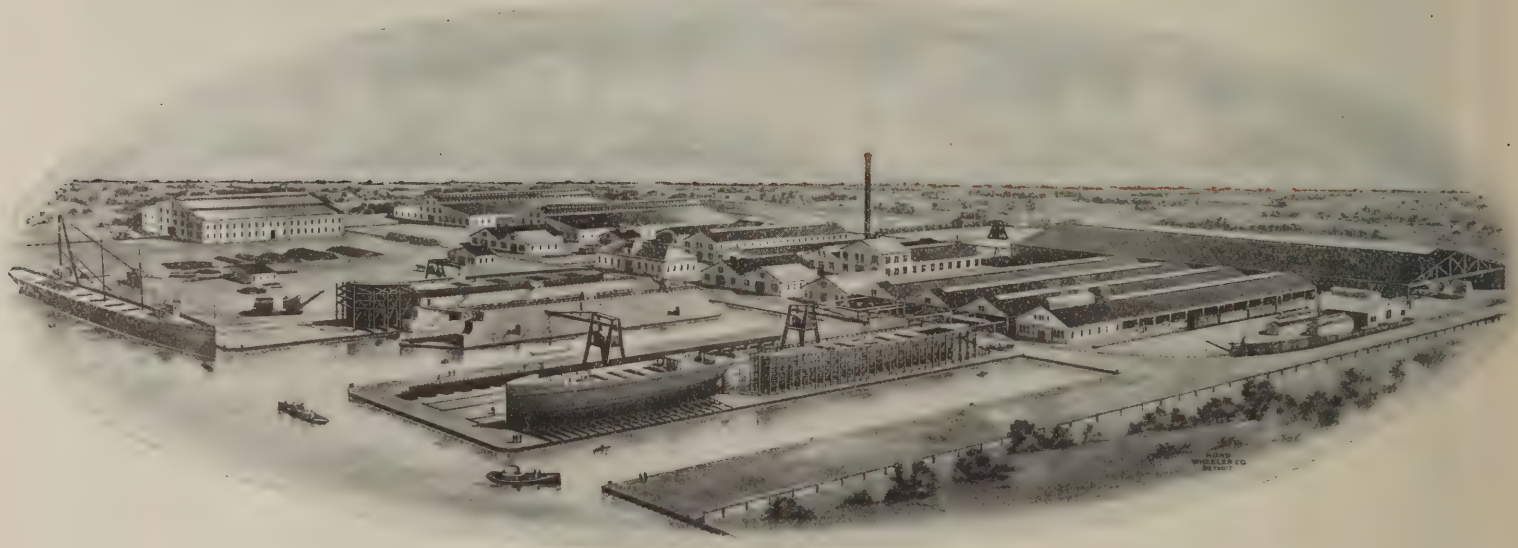

ECORSE PLANT—Ship Building—Dry Docks—Repairs

ASHTABULA PLANT—Ship and Engine Building—Dry Docks—Repairs

DETROIT PLANT—Engine Building and Repairs

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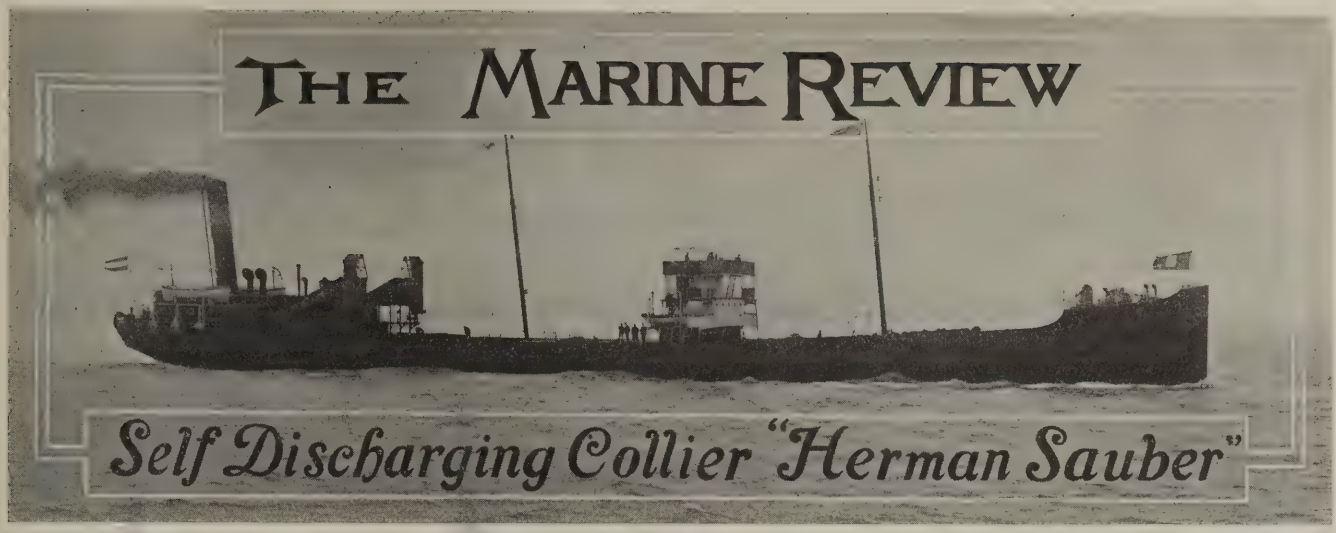


VOL. 42 CLEVELAND DECEMBER, 1912 NEW YORK No. 12

Self-Discharging Collier

JAN 4 1927

Steamer Herman Sauber, Constructed With Belt Conveyor for Unloading

By Frederick C. Coleman

A NEW system of belt-conveyor discharge has been installed by William Doxford & Sons, Ltd., in a new vessel, the steamship Herman Sauber, which they have recently built at the Pallion ship yard, Sunderland, Eng., to the order of Sauber Bros., of Hamburg. This vessel has a length between perpendiculars of 315 ft., and a carrying capacity of 3,750 tons on a draught of 18 ft. 9¼ in., and at a service speed of 10 knots. The machinery, comprising triple-expansion engines and forced draft boilers, is placed aft and provides space for the incline of conveyors, which, at one operation, convey the cargo from the holds and elevate it into the stern of the vessel.

The Herman Sauber is built on the single-deck system, with long poop and topgallant forecastle and subdivisions in holds as may be necessary for trade intended, or with one clear hold continuous from machinery compartment to fore peak. The framing of the vessel is all vertical, not only on the sides of the vessel but also on the bulkheads, and no longitudinal stringers are fitted, nor any horizontal interruption to the gravitation of the cargo to the conveyors. Compensation stringers are fitted at the breaks with inclined covering plates and a free flow of all cargo is insured.

The bilges of the vessel are occupied by large enclosed ballast spaces which join onto the double bottom ballast spaces and together provide a total ballast and bunker condition of almost half loaded; and they provide a double skin to the vessel, rising to within a short distance of the load line, forming an ample provision against damage and fully compensating for the absence of the ordinary athwartship bulkheads in holds. The vessel is also provided with transverse watertight bulkheads enclosing the machinery space, the after peak and also the fore peak spaces.

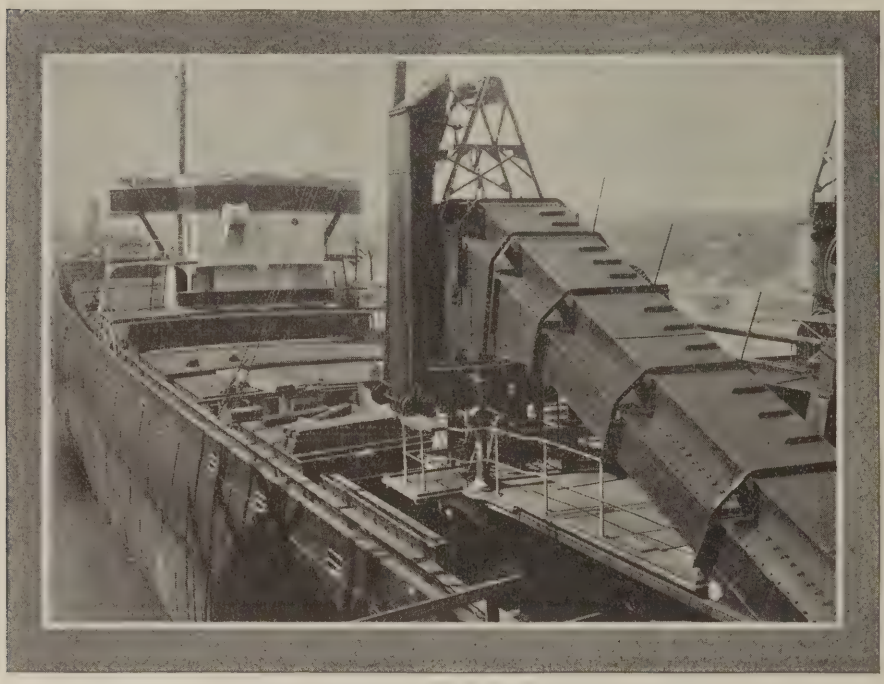
Great Breadth of Hatchways

The self-trimming hatchways for loading are of great breadth, extending to about 4 ft. from each side of the vessel and are practically continuous fore and aft, being only broken at intervals for free access for fitting tarpaulin covers and for the necessary space for navigation and cabin accommodation. They are constructed with 32-in. coamings, portable girders and covers and provision for battening down. The portable girders are fitted in a special manner, lying fore and aft, and have appliances supplied so that two men can easily move them by hand to clear the hatch of all obstructions when such is desired, and in no case do they need winch power to assist them.

Cabin accommodation is provided on deck in roomy houses for captain, officers and engineers, and in topgallant forecastle for crew, and near machinery casing on poop deck for firemen, together with liberal provision for bathing and all sanitary appliances. The center portions of the bottom of the holds between the bilge ballast tanks is fitted with an inclined top tunnel giving free access to both conveyors, which are situated on both sides of the vessel, and together with the inclined bilges gravitate all the cargo to the feeding doors to the conveyors.

The slow speed conveyors, two in number, are on either side of the hold. They are constructed on the Doxford patent system of continuous steel rope drive, with steel blocks fitted at intervals by a specially devised method. These blocks engage with the driving gear and also carry the compressed steel trays which are also specially designed and travel on continuous angle guides, traversing the whole length under the holds. These conveyors rise at a proper incline through the machinery space

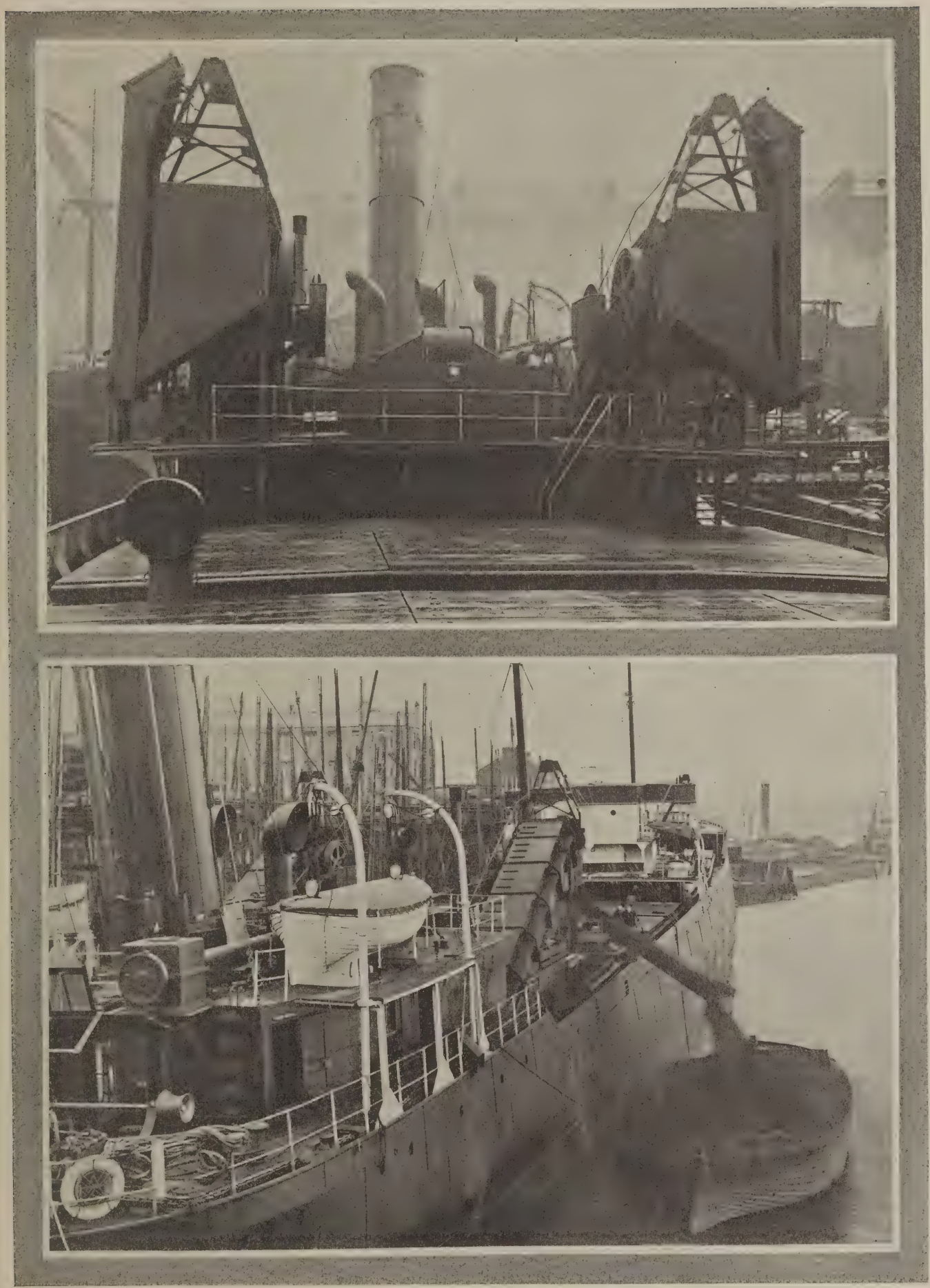
and deliver the cargo in the stern of the vessel, where it is received onto a second pair of conveyors and conveyed forward, and at the same time elevated to a suitable point of discharge. In cases where it is intended to deliver on wharf a shore gear can be ecanomically arranged to receive the cargo direct from the first conveyors in the stern and reduce the capital cost of the vessel. The feeding arrangement for the cargo to the conveyors is by means of drop feed doors spaced at regular intervals along the hold, the spaces between the doors being occupied by V-shaped hoods, which give access to each door from the tunnel, and together with the transverse incline of the tunnel and tanks form an automatic feed. These doors are fastened in position by an ordinary locking bar with preventor pins and are opened by the operator in the tunnel one after another, but in no case is more than one door to be opened at one time on either side of the vessel. The operator, after withdrawing the locking bar, stands by and in case of ordinary cargoes has nothing further to do beyond closing the door when the run has ceased and then opening the next. In vessels of this design intended to carry large Welsh coal a special slide door would be fitted in each hood to supplement the aperture of the drop door. This slide door is only used as a means of relieving stoppages—not as a permanent increase. In case of large Scotch, Yorkshire or Welsh coal, he may from time to time require to release a partial stoppage, which, however, is easily done by means of hook or pinch bar provided for that purpose. In case of large Welsh coal, two operators will, however, be required for each conveyor in the tunnel, as freeing stoppages by the slide door in this large coal will occasionally have to be supplemented by a hook or pinch bar and the attendance is more continuous. One feed door gives a discharge of 200 to 400 tons per hour, allowing for stoppages for moving barges or train, varying only with the class of coal, small coal giving the larger quantity. And as the vessel discharges on both sides with two conveyors the cargo is delivered at 400 to 800 tons per hour. Direct communication is provided between the deck and tunnel by electric bell and voice tube, and between the deck and engine room by telephone.



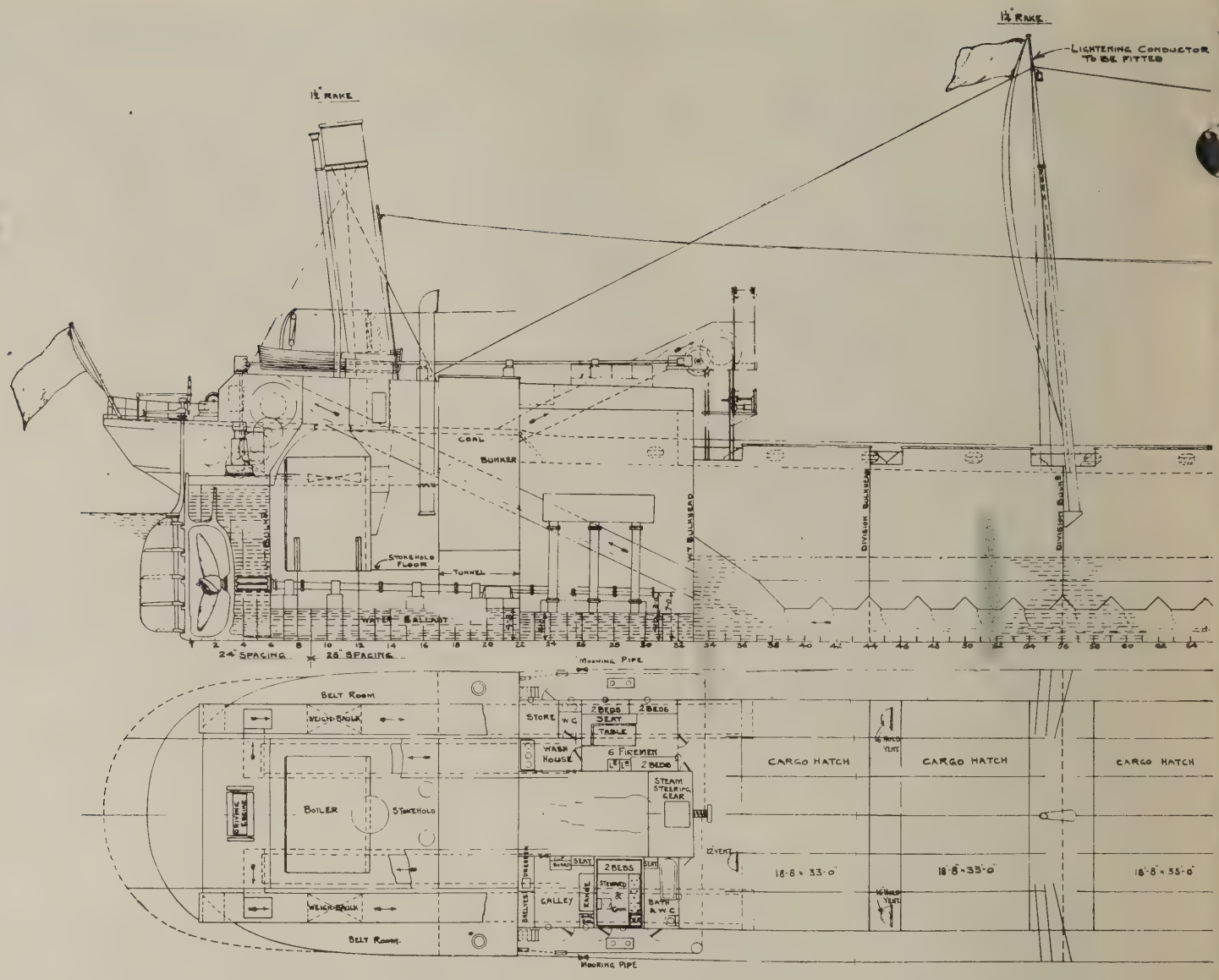
COLLIER HERMAN SAUBER, LOOKING FORWARD

The driving gear for the conveyors consists of a compound surface condensing high-pressure engine, driven from main boilers and connected to the conveyors by gearing, giving a speed of conveyor of 80 ft. per minute. The gear is driven through Edmiston clutches which instantaneously stop and start the conveyor on either side of the vessel with its full load. This enables the officer in charge on either side of the deck to have the loading of a barge or truck instantly stopped for moving the receiving vessel and instantly started again by communicating by means of the usual telegraph installation. Delivery shoots are fitted on both sides and operated by hand winches for lifting and lowering to suit the height of vessel alongside and have a controlling door on the end of the shoot operated from the deck by the same operator, so that the load is further manipulated according to the breadth of the barge and the rush of the coal is restrained and breakage avoided. The vessel is fitted throughout with complete installation of electric light, including liberal lighting of tunnel and a lamp in each hood for the operator. Ventilation of the tunnel space is provided by electric fan, fitted in the deck house, delivering a large volume

CARGO HOLD OF STEAMER HERMAN SAUBER



TWO GRAPHIC VIEWS OF THE COLLIER HERMAN SAUBER



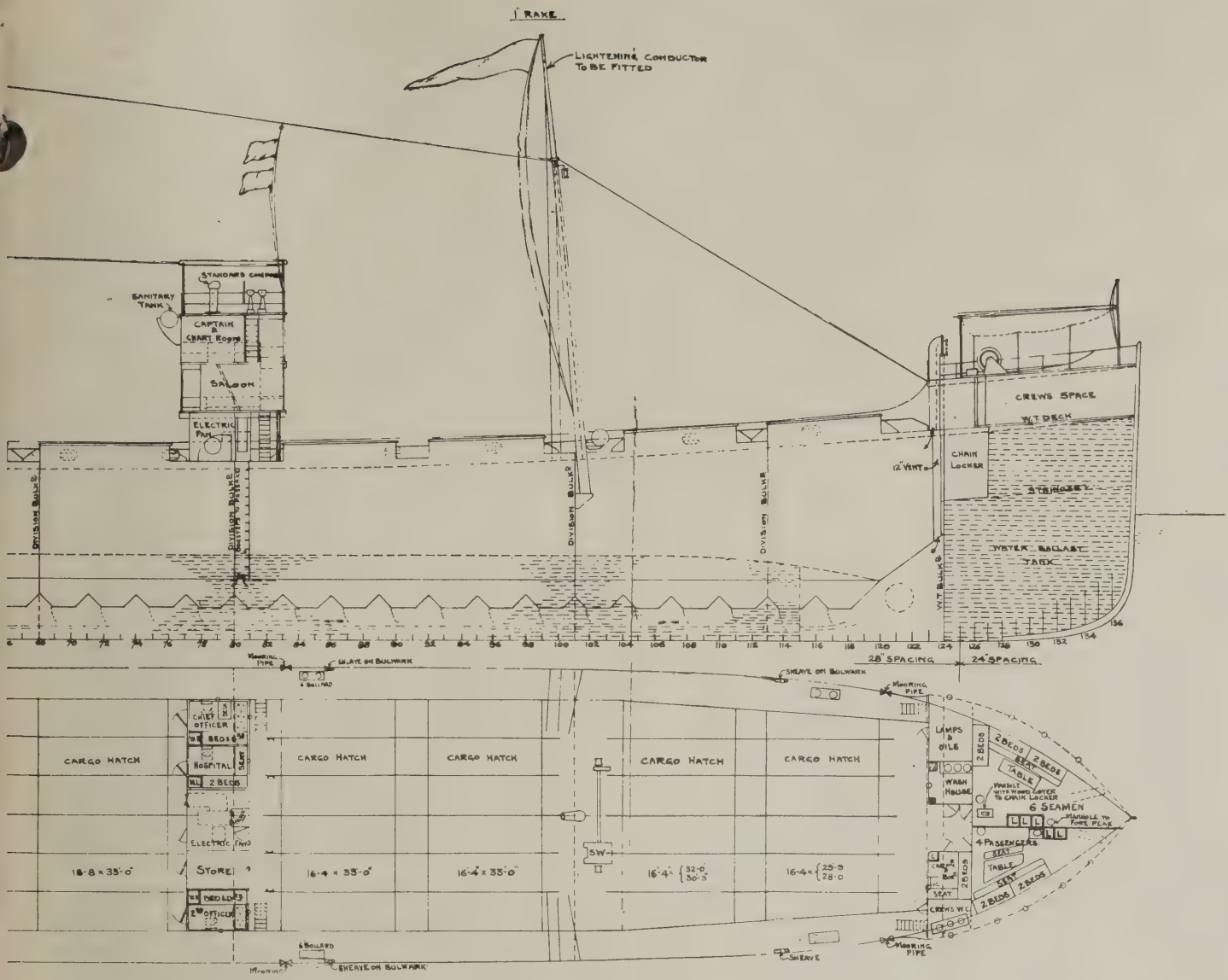
INBOARD PROFILE AND DECK PLAN

of fresh air into the tunnel, which in addition to providing fresh air drives gas and dust back into the holds and keeps the tunnel free. The inlet ventilator truck also forms an entrance from the deck to the tunnel, being fitted amidships. The tunnel is also provided with an outlet ventilator at both ends and entrance through watertight doors from machinery space. The holds are ventilated by ventilators on deck. The staff required to work the discharge of the vessel is: A fireman for the boiler, an engineer for driving engine, a greaser, two laborers in the tunnel to open doors, two spare laborers on deck to attend to clearing up holds after cargo has run out, the tunnel operators then re-opening the doors if any coal is reported left in hold.

The cost of discharge (coal, oil and labor) is less than a farthing per ton. The whole gear, being of substantial construction, with very few working parts and of slow speed, it is believed that the upkeep will not exceed the ordinary expenditure on the usual winch outfit, and a considerable saving will be found as against derricks, falls, blocks, guys, etc. Shore labor is practically dispensed with, and the vessel is freed from the risks of labor stoppages to this extent. This also enables the vessel on occasions to run the cargo out instead of being delayed by weather conditions, under which the ordinary big shore gang will not work. Where a proper supply of receiving barges is arranged, the Herman Sauber can complete discharging in six hours for any coal except large Welsh, which may take nine to ten hours. The use of this gear reduces the breakage of coal, as handling is minimized. When the delivery shoots on deck are provided with covers, there is an absence of dust, excepting only that from the barges where the coal is delivering; the transportation of the whole of the coal being under cover.

Statistics of Internal Commerce

If proposals recently suggested are worked out, the railroads will within a year or more be reporting the kinds and volume of commerce carried over their lines, as will also the steamship companies, to the Interstate Commerce Commission, in addition to the present financial statement that is monthly and yearly. This plan has arisen incident to the proposal of the reorganized Bureau of Domestic and Foreign Commerce in the Department of Commerce and Labor to eliminate hereafter the statistics on internal commerce. This bureau is not collecting the statistics this year, owing to the failure of congress to allow an appropriation. The figures were very valuable to the Interstate Com-



OF THE STEAMER HERMAN SAUBER

merce Commission and have frequently been used by the commission in estimating costs of service. It has been suggested that the commission itself arrange to collect this data in the future. It is believed that under the law the railroads and steamship lines could be required to make reports on the kinds and volume of commerce handled by them to the Interstate Commerce Commission.

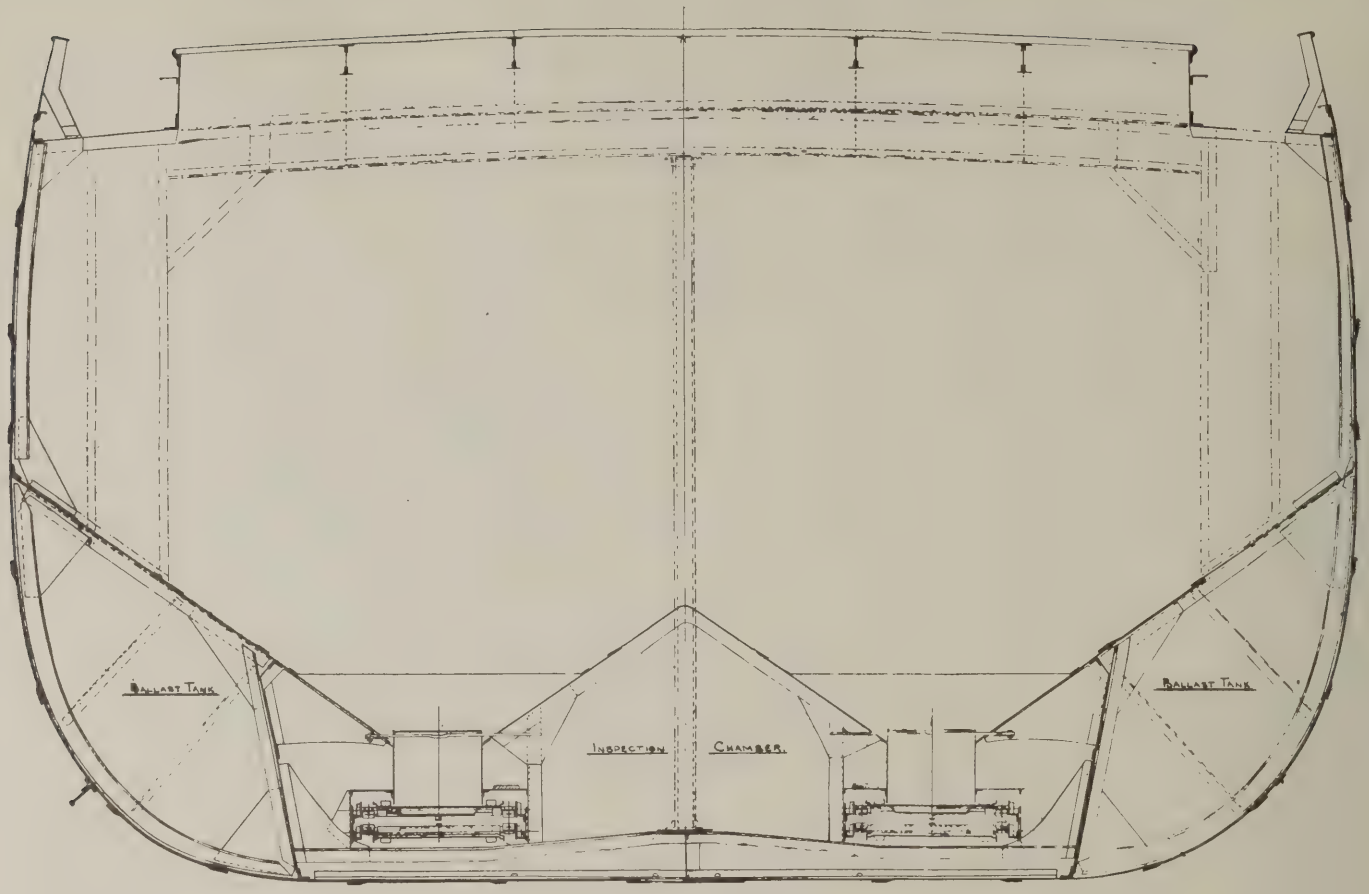
These traffic reports are very valuable and it is regrettable that they should have gone so long uncollected. The Bureau of Statistics a few years ago took up the work of collecting the statistics of water-borne commerce, but as the giving of the information was not mandatory the statistics were obviously incomplete and some of the lines failed to furnish the information. There is no good reason why the information should not be forthcoming, and there are many why it should. It affords a very reliable index of the general growth of industry. If the power of the Interstate Commerce Commission to collect this data is not ample, it should be made so.

Hopper Steamer for Fleetwood

Messrs. Wm. Simons & Co., Ltd., Renfrew, launched the Preesall, a twin-screw hopper steamer constructed to the order of the Lancashire & Yorkshire & London & North Western Joint railways for Fleetwood harbor. In accordance with the builders' well-known practice the vessel was launched complete with steam up ready for work. The Preesall is propelled by two sets of triple-expansion surface condensing engines and two multitubular high pressure steel boilers, easily capable of supplying engines with steam for a speed of 9 knots per hour. All the most modern auxiliaries are provided in the engine room, including steam and hydraulic reversing gear, independent pumps, etc. A steam windlass is fitted forward and a steam capstan aft for warping purposes. The hopper for carrying the spoil is divided into compartments and the discharge doors are controlled by steam appliances designed so that each compartment may be emptied independently of the others or that all the compartments may be discharged at the same time. Roomy and well ventilated cabins are provided for the accommodation of the officers and crew.

The construction of the vessel, which is classed 100 A-1 at Lloyds, was carried out under the direction of Geo. Hughes, chief mechanical engineer to the company, and W. Johnson, superintending engineer of the company's engineering works at Fleetwood, assisted by D. Heggie, resident inspector.

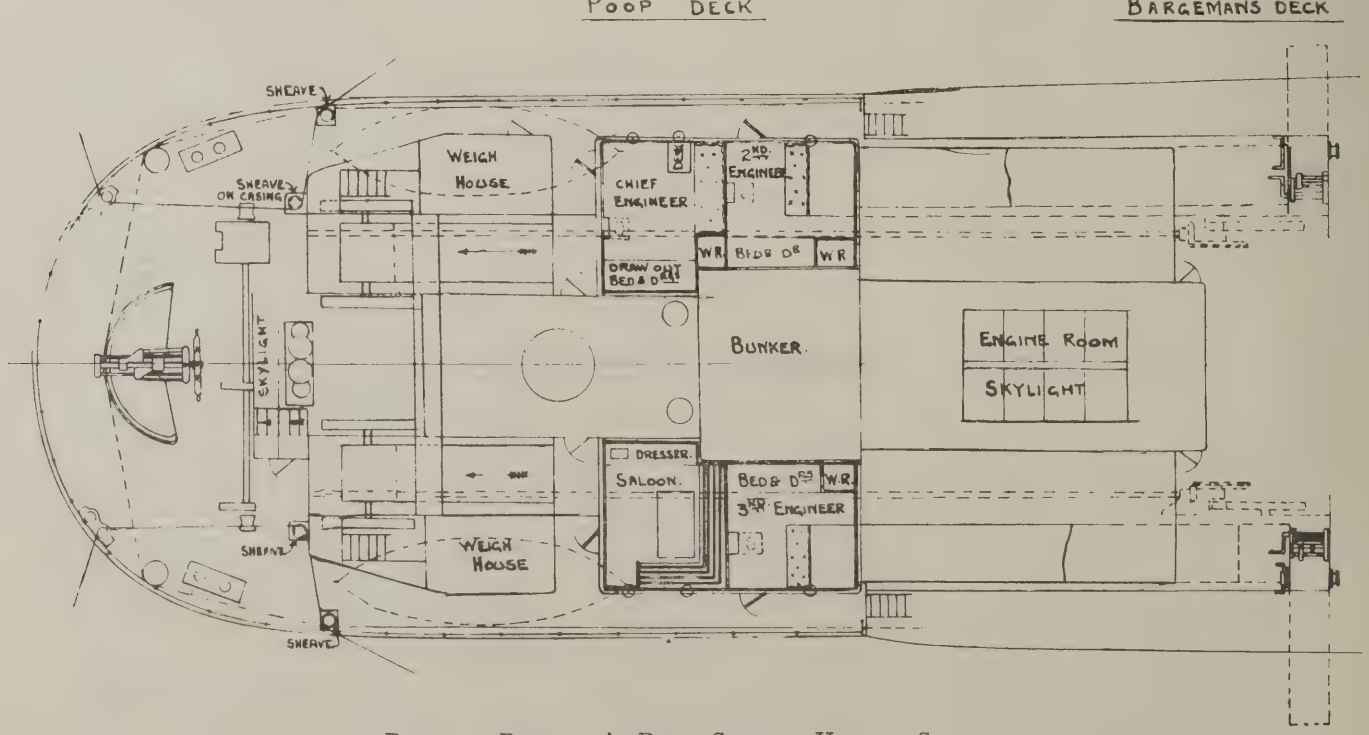
Lake shipbuilders have been asked for bids for lengthening the steamer Empress of Midland, 72 ft.



MIDSHIP SECTION OF THE STEAMER HERMAN SAUBER

Depth of the Ocean

Where are the deepest depths of ocean? The record is held for the present by a spot which lies 40 nautical miles east of Northern Mindanao, one of the Philippine Islands. The German survey ship Planet, taking soundings under conditions which permit the fullest confidence in the accuracy of the result, found there a depth of 9,780 metres or 5,348 fathoms. The greatest depth previously known was that found by the American ship Nero, near Guam, in 1899, which was 5,268 fathoms. The German surveyors have managed to determine the bottom temperature, and also to secure a specimen of the sea bottom from its bed more than six miles below the surface.



POOP AND BARGEMAN'S DECK, STEAMER HERMAN SAUBER

Dominion Steamer Estevan

Description of a Lake-Built Vessel Intended for Service on the Pacific Coast

THE Collingwood Ship Building Co., Collingwood, Ont., have just completed the twin-screw steamer Estevan to the order of the Dominion government's department of marine and fisheries, and is specially designed to handle the lighthouse and buoy service on the Pacific coast.

The vessel has a handsome appearance and is fitted up in the latest and most expensive style. Her principal dimensions are 200 ft. between perpendiculars, 38 ft. molded beam and 17 ft. 6 in. depth molded to main deck, the superstructure consisting of a top gallant forecastle, and a combined poop and bridge. Over the bridge a boat deck is fitted for the accommodation of boats, wheelhouse, wireless telegraph room, etc.

As heavy gas buoys have to be lifted on deck, special attention has been given to the arrangement of a heavy derrick on the foremast together with the necessary purchases and rigging of heavy steel wire. The motive power is supplied by a 20-ton, five-drum winch fitted under the forecastle, the levers for controlling which are led to the forecastle deck to enable one man to handle the hoisting, guying and other necessary motions. On completion the mast, derrick and winch were subjected to a test load of 30 tons, which was handled in a satisfactory manner. The other deck machinery consists of a steam warping windlass, and two heavy winches situated on the forecastle deck, a boat hoist winch on the boat deck, a warping capstan at the after end of bridge deck, and a quadrant, steam and hand steering gear fitted in a steel house aft. All the above machinery and gear is of British manufacture.

The Dining Saloon

The dining saloon, which is situated on the main deck aft, is paneled in oak and upholstered in leather to harmonize with the walls. The ceiling is paneled in pine, painted flat white and tastefully decorated. A dining table to seat eight persons is provided, also two small circular side tables, two large easy chairs upholstered in leather, two handsome oak sideboards, an oak book case, etc. The floor is covered with heavy cork linoleum, on which is laid an artistic pile carpet, tapestry curtains being fitted to the ports and doors. The apartment is supplied with light and air by a teak wood skylight overhead, while two large ceiling electric fans are provided for use in hot weather.

A handsome polished mahogany staircase leads from the saloon to an entrance house on the bridge deck from which access is had to two special staterooms of large size which are provided for the use of the government officials. The entrance is paneled in polished mahogany and upholstered in first quality moquette, while the staterooms are paneled in pine, enameled white. Each is fitted with two bedsteads having nickel plated lee rails and spring mattresses, polished mahogany wardrobes, folding lavatory, easy chairs upholstered in moquette, curtains for sidelights and doors, etc., a heavy carpet, also cork linoleum being provided for the floor.

The captain's and chief officer's cabins are situated on the bridge deck, and are fitted and finished in a similar manner to the two staterooms.

THE CANADIAN LIGHTHOUSE TENDER ESTEVAN, BUILT BY THE COLLINGWOOD SHIP BUILDING CO., COLLINGWOOD, ONT.

A large and handsomely furnished mess-room is provided near the dining saloon for the use of the officers. The accommodation for the junior officers, engineers and petty officers is situated amidships under the bridge on either side of the engine and boiler casing. Each room is finished in polished hardwood and tastefully upholstered in velvet plush. Curtains are provided for doors and windows and the floor is covered with cork linoleum, carpet squares being also provided. Beds with spring mattresses and brass lee rails, wardrobes, bureaus, drawers and folding lavatories with fresh water supply, etc., are fitted. A similar mess-room is also provided for the use of these officers. Accommodation for 12 seamen and 16 firemen is provided in

the lower deck forward, fitted up in the latest and best sea-going style.

The sanitary accommodation throughout the ship is on the most modern principle and comprises a large bath room for the officials, with porcelain enameled bath tub, porcelain valve closet, handsome basin, toilet fixtures, etc., the floor being neatly tiled and covered with gratings. A bath room with porcelain enameled bath tub and porcelain basin is supplied for the engineer and one for the officers. Shower bath, lavatories and closets are fitted forward for the crew. The steward's department is exceptionally well provided for and comprises a large well-ventilated galley replete with all the latest cooking appliances, situated at the front of the bridge, and a well furnished pantry near the saloon. For the preservation of food a large refrigerator is fitted on the lower deck at the after end of the vessel and is divided up into meat, vegetable, ice and handing rooms. Alongside the refrigerator is also fitted a large room for carrying bulk stores. The rooms are cooled by brine circulation from a CO_2 machine supplied by Messrs. J. & E. Hall, and fitted in the main engine room.

Electric Equipment

Electric lighting is provided throughout the vessel by two dynamos of 110 volts, direct-coupled to enclosed engines running at 500 revolutions per minute. The wiring is on the double wire system and cables passing through cargo spaces and engine and boiler rooms, are armored, while those in the cabin accommodation are lead covered. The globes for the lights in the dining saloon are of cut glass, those in the remaining cabins throughout the ship being frosted. A powerful searchlight of 25,000 candle power is fitted on the flying bridge, but arranged so that it can be maneuvered from on deck or from inside the pilot house. A system of electric bells is provided from the pantry to the dining saloon, state rooms, entrance, captain's cabin, chief engineer's room and bath rooms, white electric fans are fitted in the saloon, state rooms, captain's cabin, officers' mess and chief engineer's cabin.

A complete installation of wireless telegraphy has been installed in a steel house situated on the boat deck, and consists of spreaders, insulators, generators, switchboard, accumulators, transformers, aerials, etc., etc., all in accordance with the most modern practice.

The propelling machinery consists of two sets of triple-expansion surface condensing engines having cylinders 15 in., 25 in., 42 in. and 26-in. stroke, running at 130 revolutions per minute. Steam is supplied by two Scotch multitubular boilers, 10 ft. 6 in. by 14 ft. diameter, working under Howden's forced draft, the working pressure being 180 lb. per square inch. The auxiliary machinery consists of two centrifugal circulating pumps, two air pumps, two feed pumps, also bilge, sanitary, fresh water, ash ejector, ballast and general service donkey pumps. A large evaporator feed heater and filter have also been installed. The propellors are of bronze, and each is fitted with four blades. A large engineer's workshop is fitted adjacent to the engine room and contains a 6-in. center lathe, a drilling machine to drill up to 1½ inches diameter, a shaping machine, emery wheel, grindstone and three vises, the whole of the plant being driven by a 5 H. P. motor. A blacksmith shop has also been installed, fitted with forge, vise bench and other appliances necessary for carrying out the repair work in which the vessel will be engaged. The auxiliary machinery, deck and engine room and steward's stores, also plate, etc., has been furnished almost without exception by firms in Great Britain.

The vessel ran her official trials over the measured mile course at Owen Sound on Oct. 22, when highly satisfactory results were obtained. On returning to Collingwood the machinery was opened up for examination and the vessel put in trim for her long voyage to Victoria, B. C., by way of Cape Horn. During the trials the department of marine and fisheries was represented by Mr. Doutre, purchasing and contract agent for the department of marine and fisheries; Chas. Duguid, naval constructor, under whose supervision the vessel has been built, and Comdr. Howe. The builders were represented by Capt. McDougall, president of the Collingwood Ship Building Co; James M. Smith and J. S. Leitch. During the trials the vessel was under command of Capt. P. M. Campbell, of Collingwood.

Importing Ships' Material Free

The treasury department has announced its interpretation of that clause in the Panama canal act, which permits ship materials to be imported free. There has been considerable concern over the matter and at one time it looked as though the department would permit the importation of a whole ship in a knocked-down condition. The president found it necessary to take hand in the matter and the regulations as announced embody doubtless some of his views. The preliminary drafted regulations as sent out by the treasury department interpret the points in controversy as follows:

A vessel will be defined as any water craft entitled to be documented under the laws of the United States, and similar craft for which there is no such requirement such as battleships, revenue cutters and government vessels. This will include every vessel of over 5 tons, whether used by the government, for commerce or for pleasure.

Machinery will not be entitled to free entry. Included in the term "machinery" will be auxiliary machinery such as pumps, steam winches, hoisting engines, electric motors and generators and condensers.

The term "outfit and equipment" will be defined as including all portable articles not permanently incorporated in the hull or machinery and will include rigging, tackle, boats, life saving apparatus, wireless apparatus, searchlights, lamps, bedding, furniture, tableware, small arms, etc., but will not include consumable supplies such as coal, food, medicines, etc.

The term "outfit and equipment" will also be held to include not only the original outfitting and equipping, but also renewals and replacements.

Materials will be defined as including merchandise suitable for use in the construction or repair of a vessel or to be incorporated therein after having undergone a process of manufacture subsequent to importation or in its condition as imported provided it has been purchased in the open market and was not constructed or fabricated on a special order or after a special design. This would include raw material such as pig iron and lumber, rough forgings and castings, but not finished ones, nuts, screws, bolts, steel plates, ships' knees, flooring and other things which though complete articles are useful as parts in the construction of something else.

The word "articles" is defined as including only such articles as are suitable for use in their condition as imported. In the outfit or equipment of a vessel such articles may be fitted, polished, painted or otherwise improved or fixed in place subsequently. Shipbuilding materials may be entered for warehouses and withdrawn as desired within three years from date of importation free of duty upon compliance with the regulations.

Isherwood Construction System-IV

In Which the Author Deals With the Longitudinal and Transverse Framing

By Robert Curr

The plan with this article shows the longitudinal and transverse framing of the vessel as it would look when the vessel is framed ready for the outside plating. It might be better termed the skeleton than the other showing the lines only.

The longitudinal frames marked A, C, D, E, F, G, H, K, M, N, O, P, R, compose the longitudinal framing of the vessel. On the great lakes of America these frames are numbered from the keel to the deck.

I am lettering these frames so that the reader may not get mixed up with the transverses, which are numbered from No. 1 to No. 31.

The longitudinal framing is by no means new, for the Great Eastern and a few vessels were built at that time on the lengthway system of framing.

In order to get longitudinal framing then, the cross section became intercostal, while the Isherwood system is continuous in both cases.

The transverses in the Isherwood system are simply the web frames used in the cross framing of vessels. These transverses are slotted out for the longitudinals to pass through and inside of the slots the web may be made to suit any requirements.

The transverse sections of the vessel being fair the hull is considered in ship shape. Reference may only be made to the body and sheer plans for the fairing up of the longitudinal frames. In this case the midship frame measures around the half girth 37 ft. 4 in. This length is divided by 14 and gives 13 frames, spaced 32 in. apart. This spacing of longitudinal frames is carried out as near as possible from stem to stern, as shown by body plan.

Where the vessel becomes fine at the bow and around the boss it simplifies matters by putting in short transverse frames, as shown by a, b, c, forward, and d, e, f, aft. The longitudinal frames are stopped short of the intermediate frames.

Frame A runs from the fore peak bulkhead to the intermediate frame d, which is watertight and forms the end of the water bottom.

The frame A is cut at the watertight divisions and connected to same with plate brackets and fastened with a number of rivets equal to the area of section of the angle composing the frame.

Frame C forms a longitudinal from the collision bulkhead to transverse No. 29.

Frame D forms a longitudinal from transverse No. 3 to transverse No. 27.

Frame E forms a longitudinal from transverse No. 4 to transverse No. 26.

Frame F forms a longitudinal from transverse No. 5 to transverse No. 24.

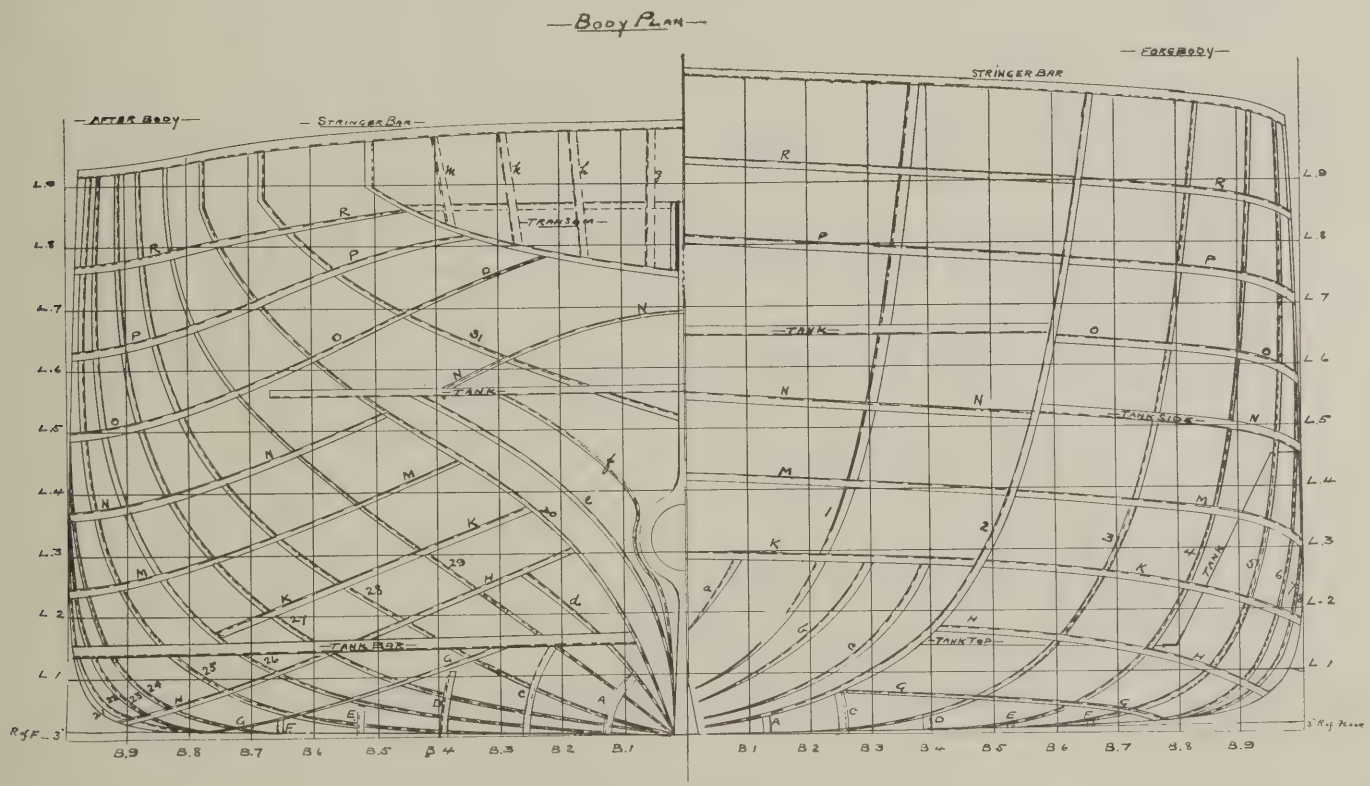
Frame G forms a longitudinal from the collision bulkhead to transverse No. 28.

Frame H forms a longitudinal from the collision bulkhead to transverse No. 27.

Frame K forms a longitudinal from the stem forming tank bar aft to transverse No. 30.

Frame M forms a longitudinal from the stem forming tank bar aft to transverse No. 30.

Frame N forms a longitudinal from



Body Plan, Showing Longitudinal and Transverse Framing

the stem (No. 2 to No. 20 tank at side) to transverse No. 30.

Frame O forms a longitudinal from No. 2 to transom frame.

Frames P and R form a longitudinal from stem to transom frame.

G and H frames at the after end stop at the tank top; H is continued above the tank to frame No. 30 and the intermediate is carried to H.

The frames above the tank top run parallel with the sheer and are cut at the watertight bulkheads, being made up at the bulkheads similar to the longitudinals in the water bottom.

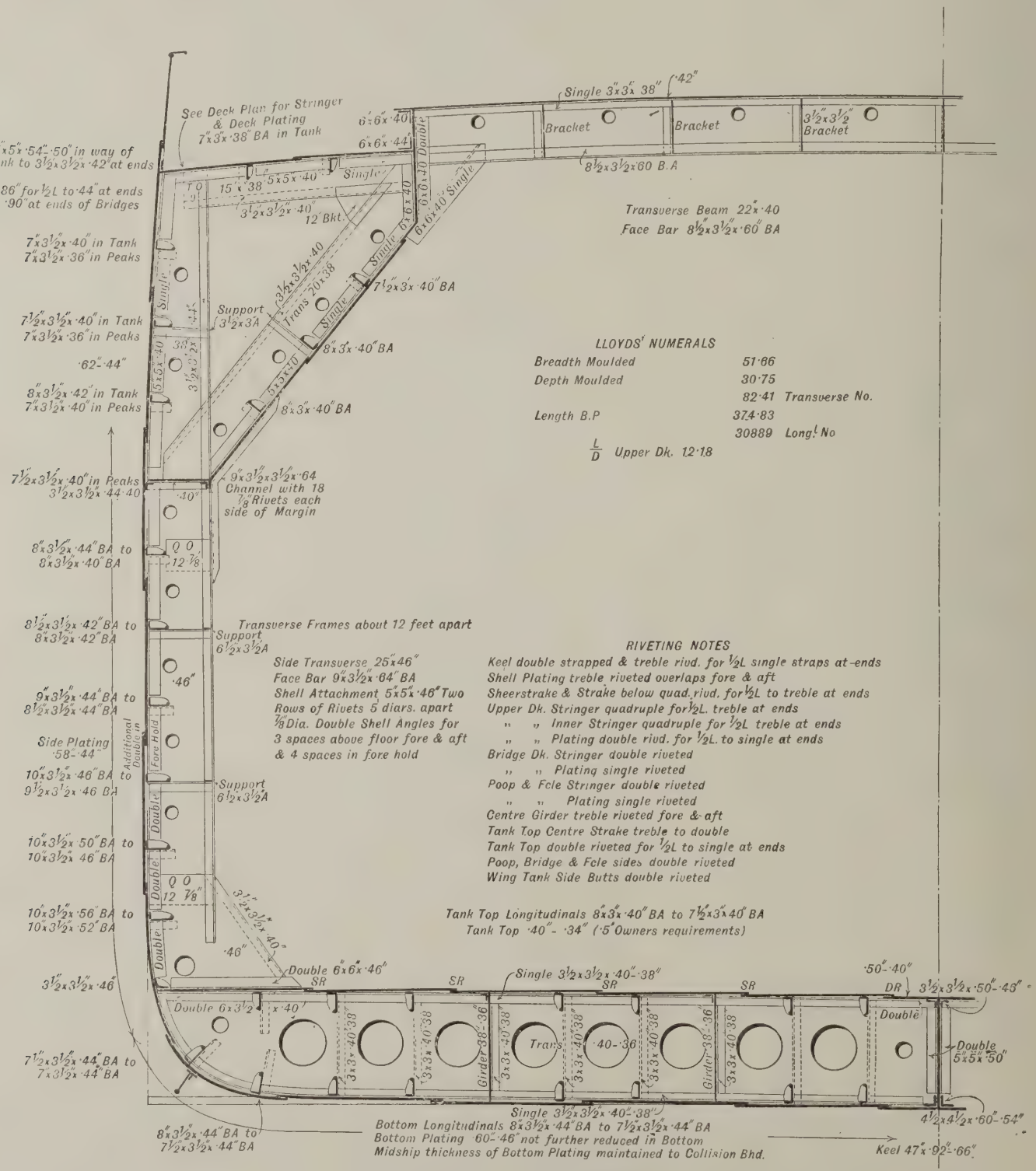
The longitudinals in the bottom are run parallel to the keel or center line of ship.

The deck longitudinals are run parallel to the center line as shown on the midship section. The three longitudinals at the side are of importance but the others are merely stiffeners.

Aft of the transom frame the longitudinals are slanted and are termed cant frames similar to the transverse framing arrangement.

Steamer Maskinonge

The steamer Maskinonge has recently been delivered from the shipyard of Short Bros., Sunderland, England, to the order of Liverpool owners for the Canadian coal trade, being under charter to the Dominion Coal & Iron Co., Sydney, Cape Breton Island. The steamer is intended to operate between Sydney and Montreal in the coal trade, making a round trip per week. The Maskinonge is 388 ft. over all, 375 ft. keel, 52 ft.


See Deck Plan for Stringer & Deck Plating
7"x3"x.38" BA in Tank
Single 3"x3"x.38" (.42"
Bracket
Bracket
3½"x3½" Bracket
8½"x3½"x.60 B.A
Transverse Beam 22"x.40
Face Bar 8½"x3½"x.60" BA
LLOYDS' NUMERALS
Breadth Moulded 51·66
Depth Moulded 30·75
82·41 Transverse No.
Length B.P 374·83
30889 Long.l No
L/D Upper Dk. 12·18
RIVETING NOTES
Keel double strapped & treble rivd. for ½L single straps at ends
Shell Plating treble riveted overlaps fore & aft
Sheerstrake & Strake below quad. rivd. for ½L to treble at ends
Upper Dk. Stringer quadruple for ½L. treble at ends
" " Inner Stringer quadruple for ½L treble at ends
" " Plating double rivd. for ½L. to single at ends
Bridge Dk. Stringer double riveted
" " Plating single riveted
Poop & Fcle Stringer double riveted
" " Plating single riveted
Centre Girder treble riveted fore & aft
Tank Top Centre Strake treble to double
Tank Top double riveted for ½L to single at ends
Poop, Bridge & Fcle sides double riveted
Wing Tank Side Butts double riveted
Side Transverse 25"x46"
Face Bar 9"x3½"x.64" BA
Shell Attachment 5"x5"x.46" Two Rows of Rivets 5 diars. apart
⅞ Dia. Double Shell Angles for 3 spaces above floor fore & aft & 4 spaces in fore hold
Transverse Frames about 12 feet apart
Tank Top Longitudinals 8"x3"x.40" BA to 7½"x3"x.40" BA
Tank Top .40" - .34" (.5" Owners requirements)
Bottom Longitudinals 8"x3½"x.44" BA to 7½"x3½"x.44" BA
Bottom Plating .60"-.46" not further reduced in Bottom
Midship thickness of Bottom Plating maintained to Collision Bhd.
Keel 47"x.92"-.66"

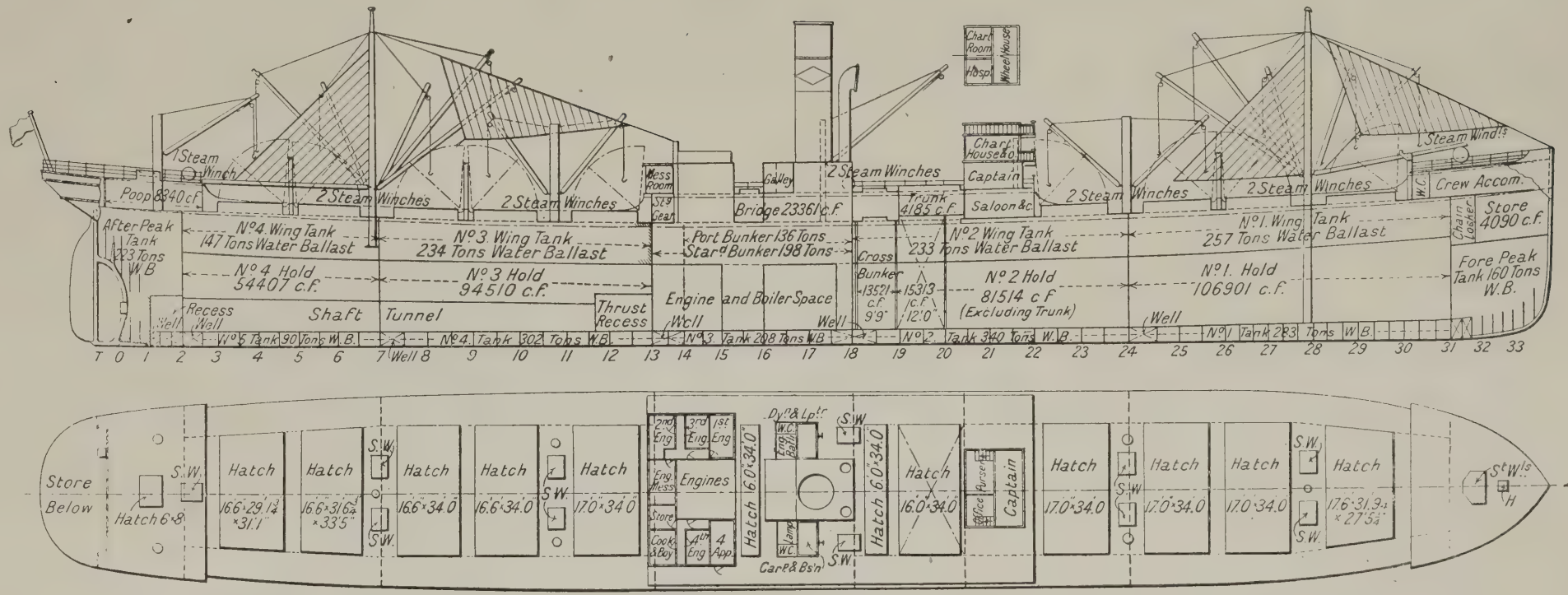
MIDSHIP SECTION OF STEAMER MASKINONGE

Drafts		Freeboard	Deadweight
Fresh Water	25'.4¾"	= 5'.8½" Side	= 8152 Tons
Indian Summer	25'.4¼"	= 5'.9" ,,,,,	= 8132 ,,,,,
Summer	24'.10¾"	= 6'.2½" ,,,,,	= 7918 ,,,,,
Winter	24'.5¼"	= 6'.8" ,,,,,	= 7704 ,,,,,

Tons per Inch at Load Water Line 39

Length	375'.0"	Tonnage U.D.	4512·80
Breadth Ext.	52'.0"	,,,,, Gross	4804·28
Depth Mld	30'.9"	,,,,, Nett	2676·01

Engines
Cylinders 26×44×73. Stroke 48". 3 Boilers 180 lbs.



Bunkers.

Port Bunker	136 Tons
Starᵈ ,,,,,	198 ,,,,,

Note. Bunkers taken at 45 c.f. = 1 Ton

Contents of Holds.

No 1. Hold	106901 c.f.
No 2 Hold	81514 ,,
Cross Bunker	13521 ,,
No 3. Hold	94510 ,,
No 4. Hold	54407 ,,
Poop	8340 ,,
Bridge (Including Trunk)	23361 ,,
Fore Peak Store	4090 ,,
Total Capacity	386.644 c.f.

Note. Cubic Capacities are taken from top of Beams to top of Ceiling and to Outside of Frames.

Water Ballast.

No 1. Tank	283 Tons
No 2. ,,	340 ,,
No 3. ,,	208 ,,
No 4. ,,	302 ,,
No 5. ,,	90 ,,
After Peak	223 ,,
Fore Peak	160 ,,
Total Contents of Double Bottom and Peaks	1606 Tons
No 1. Wing Tank	257 ,,
No 2. ,, ,,	233 ,,
No 3. ,, ,,	234 ,,
No 4. ,, ,,	147 ,,
Total Water Ballast	2477 Tons

INBOARD PROFILE, DECK PLAN AND LEADING PARTICULARS OF STEAMER MASKINONGE

beam and 30 ft. 9 in. molded depth, carrying 7,918 tons on 24 ft. 10 in. draught. She has ten large hatches fitted with telescopic covers, and is entirely self-trimming. The propelling machinery consists of a set of triple-expansion engines with cylinders 26, 44 and 73 in. diameters with a stroke of 48 in. Steam is supplied by three boilers, 14 ft. 6 in. by 11 ft. 6 in., carrying a working pressure of 180 lbs. per sq. in., equipped with Howden's forced draft. The steamer is built on the Isherwood system and has a water ballast capacity of 2,470 tons. Full particulars of her construction are given in the accompanying midships and longitudinal sections.

Molasses Steamer Nelson

The steamer Nelson, built to the order of the Cuba Distilling Co., of New York, by the Fore River Ship Building Co., Quincy, Mass., left the builder's yard Nov. 17 on her maiden trip to Cuba for a cargo of molasses.

MOLASSES STEAMER NELSON, BUILT BY THE FORE RIVER SHIP BUILDING CO. FOR THE CUBA DISTILLING CO.

The keel of this vessel was laid on May 13 last, and the vessel was launched on Aug. 12, the christening being performed by Miss Madeline E. Mayer, daughter of Mr. and Mrs. Levy Mayer, of New York.

The Nelson is an improved duplicate of the steamer Currier, built by the Fore River Ship Building Co. and owned by the Cuba Distilling Co., and will be engaged in the transportation of molasses in bulk between Cuba, Porto Rico and American ports, principally New York. She is also constructed in such a way as to enable her to enter the trans-Atlantic trade.

The principal dimensions are as follows:

	Ft.
Length between perpendiculars	370
Beam, molded	52
Depth molded to upper deck	30
Draught, loaded	23
Gross tonnage, about	4,700
Net tonnage, about	2,800

The vessel can be used for the transportation in bulk of molasses, oil, or other liquid cargo. The total stowing capacity for molasses is 190,000 cu. ft., representng over 1,400,000 gals. When carrying petroleum, with the oil carriage and tanks and inner bottom, the vessel will have a capacity of 1,600,000 gals.

The vessel has three pole masts fitted with cargo booms having a capacity of five tons each. The propelling machinery is located in the stern of the ship, consisting of a vertical inverted three-cylinder triple-expansion engine with cylinders 25 in., 41 in. and 68 in. and a common stroke of 48 in., supplied with steam at 190 lb. pressure by three single-ended Scotch boilers, working under the heated forced draft system. The engines will develop a maximum of 2,700 H. P., which will give the vessel a speed of more than 12 knots.

Robert W. Hunt & Co. have moved from the Rookery to the Insurance Exchange building, Jackson boulevard, Chicago, where they occupy more ample quarters.

Expansion of Swan & Hunter

Messrs. Swan, Hunter & Wigham Richardson, Ltd., at their Neptune Engine Works, Walker, Newcastle-on-Tyne, have for some years been actively engaged in studying and developing Diesel oil engines.

Two years ago they completed the twin screw cargo ship Toiler, which has the distinction of being the first oil-engined vessel to cross the Atlantic. She is owned by James Playfair, of Midland, Ont. Her builders at once followed up the Toiler with another similar twin screw cargo steamer for the same owner. The vessel is called the Calgary, and has greater engine power than the Toiler. Swan, Hunter & Wigham Richardson, Ltd., are now engaged in the construction of two much larger cargo boats for British owners, and carrying about twice the deadweight of the Toiler and Calgary.

As previously noted in THE MARINE REVIEW, Swan & Hunter have in hand another interesting ship being built for the Montreal Transportation Co., of Montreal. This will be the first large vessel designed for propulsion by power transmitted electrically from the engine to the propeller. The designs of the engines have been executed by Henry A. Mavor, of Messrs. Mavor & Coulson, of Glasgow, who have already tried this system on a small experimental vessel called the Electric Arc. The deadweight cargo capacity will be about 2,500 tons. The machinery will consist of two 300-H. P. high speed Diesel engines, each with its own alternating current generator and exciter. Just ahead of the thrust block there will be a specially designed motor operating a single propeller, and reducing the 400 revolutions per minute of the Diesel engines to about 80 revolutions per minute. Among the advantages claimed for Messrs. Mavor & Coulson's system of electrical transmission it may be noticed that the total power of the propelling engine required in a single unit for direct drive can be split up into several sub-units, each with its own generator, all connected to a single propelling motor. Furthermore, all reversing and speed chanages can be done by switches, and the electrical control station can be placed in any convenient spot in the ship, e. g., on the navigating bridge, in the engine room, or elsewhere.

The firm has also for some little time been developing two-stroke cycle Diesel engines. Various well-known designs of this type of engine have been critically examined and the details exhaustively analyzed. The out-

come of all this study has resulted in the Neptune-Diesel engine, which for marine purposes is claimed to be second to none. The design is substantial in its strength, no undue risks being taken by imprudently cutting down weights. Another leading feature is much greater simplicity than is found in many Diesel engines. This means a smaller prime cost and less expense in running and maintaining the engine. The builders have also aimed at easy accessibility to all parts of the engine, which is of the highest value, if ever repairs are necessary. Several radical improvements have also been introduced in the valve gear, pistons, and cooling arrangements, all of which are distinctive features in the Neptune-Diesel engine.

The Neptune Engine Works, which have been established since 1879, have been frequently enlarged and improved, and the best of modern machines have from time to time been installed to replace older tools. Partly in order to develop the Neptune-Diesel engine more successfully, and also owing to the general expansion of business Messrs. Swan, Hunter & Wigham Richardson, Ltd., have now embarked upon a complete re-organization of their engine works. This department is to be moved to another site within the Neptune shipyard, and entirely new shops are being erected.

Light Ship No. 95

The Racine-Truscott-Shell Lake Boat Co., Muskegon, Mich., recently delivered lightship Milwaukee No. 95 to the lighthouse authorities at Milwaukee. The principal dimensions of the lightship are:

Length over all, 108 ft. 5 in.

Length on waterline, 90 ft.

Beam, molded, 23 ft.

Depth of hold, 12 ft. 2½ in.

Displacement at 10 ft. 1 in. mean draught, 312 tons.

The vessel is built of steel, the hull being sub-divided by five transverse watertight bulkheads, watertight flat at bow and stern with bulkheads forming trimming tanks. She has three decks, the main and spar decks being continuous and the lower deck extending from the stem to the coal bunker bulkhead and from the stern post to the engine room bulkhead. The vessel is rigged with a mainsail, foresail and forestaysail. The frames are spaced 20 in. apart. They are 3 x 2½ x 7/16 in. for about one-half of the vessel's length, being reduced to 3 x 2½ x ⅜ in. forward and 3 x 2½ x 5/16 in. aft. The frames extend from the keel to the under side of the spar deck stringer plate and to the under side of the main deck stringer plate alternately.

The machinery consists of a single-cylinder, non-condensing engine, 18 in. diameter and 20 in. stroke, having a piston valve operated by Stevenson link and reversible by hand. Steam will be furnished by two single Scotch boilers, 8 ft. 6 in. diameter and 10 ft. long, allowed 110 lbs. pressure.

The officers and crew are housed aft. The new lightship will be equipped with a 100,000-candlepower light mounted on a steel tower rising 20 ft. above the spar deck. She will be anchored about three and one-half miles off shore due east of the pier headlights of Milwaukee.

Panama Canal Tolls

President Taft has issued a proclamation fixing the Panama canal tolls upon the basis of $1.20 per net ton with a reduction of 40 per cent on ships in ballast. These figures are based upon statistical data compiled by Prof. Emory R. Johnson, of the University of Pennsylvania, regarded as the country's leading expert on transportation problems. Briefly the provisions are:

First, on merchant vessels carrying passengers or cargo, $1.20 per net vessel ton—each 100 cu. ft.—of actual earning capacity.

Second, on vessels in ballast without passengers or cargo, 40 per cent less than the rates of toll for vessels with passengers or cargo.

Third, upon naval vessels other than transports, colliers, hospital ships and supply ships, 50 cents per displacement ton.

Fourth, upon army and navy transports, colliers, hospital ships and supply ships, $1.20 per net ton. The vessel to be measured by the same rules as are employed in determining the net tonnage of merchant vessels.

American coastwise vessels are of course exempt from the payment of these tolls, but American vessels engaged in foreign trade will pay the tolls the same as the vessels of any other country.

These rates are virtually the same as the Suez canal rates. The Suez rate during 1911 was $1.30 per net ton. When it is considered that the Suez rates have undergone a gradual reduction since the canal was opened to commerce 43 years ago, it will be seen that the Panama rates are really low. They actually begin at the lowest figure that the Suez rates have ever reached.

Prof. Johnson has made elaborate calculations as to probable commerce and estimates that about 9,000,000 tons of foreign traffic will pass through the canal during its first two years of operation. He estimates that by 1920 the traffic will amount to 11,000,000 tons and by 1925 to 14,000,000 tons. He believes that the rate can be reduced to $1 per net ton in 10 years and that the canal will be self-supporting in 20 years, basing this calculation upon an increase of 60 per cent in traffic every 10 years.

Apparently the whole purpose of fixing the tolls at these figures has been to meet the competition of Suez.

LIGHTSHIP MILWAUKEE 95, LOOKING FORWARD AND AFT

A Most Spirited Meeting

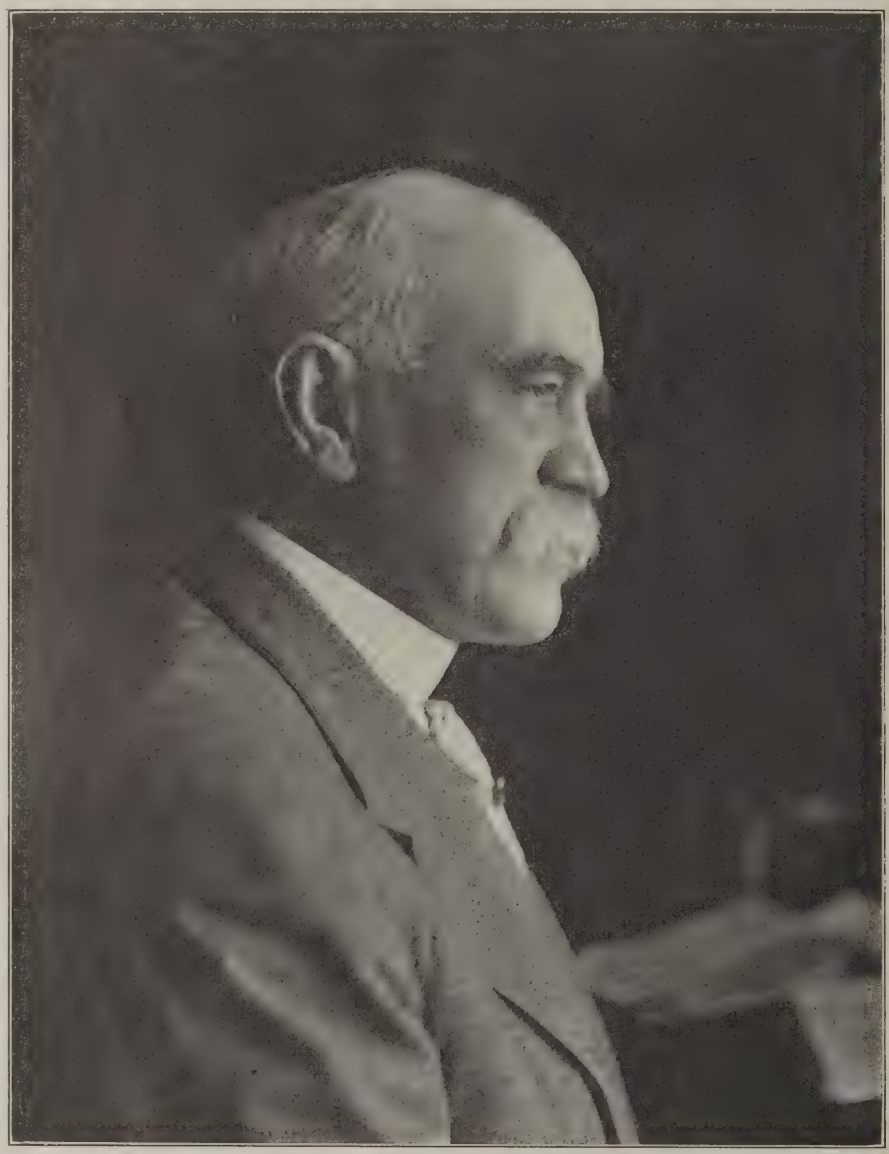
The Twentieth Annual Session of the Society of Naval Architects and Marine Engineers

THE twentieth annual meeting of the Society of Naval Architects and Marine Engineers was held in the Engineering Societies building, 29 West Thirty-ninth street, New York, on Nov. 21 and 22. In point of attendance it was the largest meeting that the Society has ever held, and in point of interest the most animated of recent years. President Stevenson Taylor presided.

The annual report of Secretary and Treasurer Cox showed total resources of $22,116.66, against which there was a liability of only $240. The membership increased during the fiscal year from 730 to 733, notwithstanding that sixteen deaths and twenty-two resignations occurred during the year. Adding the new members elected at the meeting, the total membership stands today at 785.

The members stood while the death roll was read, as follows: Clement A. Griscom, Robley D. Evans, George W. Melville, Thomas Andrews Jr., Wm. W. Bates, Walter A. Post, Henry W. Spangler, D. Howard Spear, Roger P. Stebbins, Francis H. Stillman, J. W. Lowry Waters, Emil L. Boas, John C. Silva, Samuel W. Stanton, Samuel B. Thomas and Howard Wood. The following were elected members of council for the term ending Dec. 31, 1915: Naval Constructor W. J. Baxter, W. D. Forbes, Lewis Nixon, Major L. H. Chandler, Andrew Fletcher, H. A. Magoun. John S. Hyde and Harvey D. Goulder were elected associate members of council. During the summer, Capt. A. B. Niblack was made vice president, to fill the vacancy caused by the death of Rear Admiral R. D. Evans. George W. Dickie was made vice president, to fill the vacancy caused by the death of Rear Admiral George Wallace Melville. Capt. C. A. McAllister was made member of council, to fill the vacancy caused by the death of W. A. Post. H. S. Grove was made associate member of council, to fill the vacancy caused by the promotion of Commander Niblack. Naval Constructor Frank A. Fernald was elected honorary vice president, and Lewis Nixon was elected vice president, to fill the place of Mr. Fernald. Monsieur Bertin was elected honorary member of the Society. The executive committee consists of Rear Admiral W. L. Capps, F. E. Kirby, W. I. Babcock and Stevenson Taylor.

The rules of the Society forbid a president's succeeding himself and accordingly the Society elected Col. Robert M. Thompson president, re-electing D. H. Cox as secretary and treasurer. Before the sessions ended, a spontaneous tribute of affection was paid to the retiring president, Stevenson Taylor, who was deeply moved thereby. In his annual address, President Taylor said:



COL. ROBERT M. THOMPSON
President of the Society of Naval Architects and Marine Engineers

PRESIDENT TAYLOR'S ADDRESS

"I welcome you to the twentieth annual meeting of the Society of Naval Architects and Marine Engineers, and congratulate you on your successful career. Your numbers have more than kept pace with the growth in the number of shipyards and kindred establishments; your treasury is in good condition, and your work is entirely praiseworthy.

"When we consider that on the roster of this Society there are the names of those who are responsible in one way or another for the design and construction of every important vessel and its equipment in the naval and merchant service of the United States; and feel that in all things these men, so far as opportunity is given, are advancing yearly the science of shipbuilding, we have the right to feel proud of its membership.

"Our navy has grown steadily greater, better and more efficient, and it is only necessary to have the support of our citizens to continue to do so and to hold its rightful place in the world.

"Our merchant service is doing as well as it can; our shipyards are fairly busy, though it remains to be desired that there shall be so much greater demand for new ships that many new yards will be necessary.

"The progress in the development of power for ships has been especially interesting during the past year. It is reported that at present there are thirty-four ships under construction abroad, with Diesel oil engines, twenty-three of which range from two thousand to ten thousand tons.

"The use of high speed turbines with comparatively low speed efficient propellers driven by intermediate gearing is being used under several different methods of combination; and we are now awaiting with great interest the trial of the latest development, namely, the combination of turbines and electric motors, which will soon be driving one of the large colliers of the United States navy.

The Reciprocating Engine

"All of these schemes have advantages, while our aged friend, the reciprocating engine, is still doing business at the old stand, though sometimes in combination with its rival, the turbine. It will be interesting for you to study the relative advantages and disadvantages that you may determine which combination will best answer the particular purpose for which you are called upon to design ships. It seems quite clear at present that no one scheme is best for all purposes.

"Some of the papers of this meeting and the discussion thereof will add to your fund of knowledge. Important matters that have been under consideration by your council and those that have been referred to certain committees are: The raising of an endowment fund, from the income of which may be annually awarded medals or prizes to the younger members for professional papers of special merit and extraordinary expenses that occasionally occur may be paid without using the regular income which now enables us to publish our high standard proceedings; and the advisability of changing the date of our annual meeting to nearly one month later in the year in order better to enable our members from the west and great lakes to attend the meetings, the present time happening to be very inconvenient for those members on account of business conditions existing for them between Nov. 15 and Dec. 15, each year. The committee will appreciate suggestions from the members on these matters.

The American Merchant Marine

"The American merchant marine has always been one subject that your presidents have felt called upon to mention in their addresses. I thought last year that I would not venture again to speak on that topic, but recent action of congress and recent action of the people at the polls impel me to say a few words.

"One is tempted to quote Shakespeare's Richard III, using but the first half of the sentence and say, 'Now is the winter of our discontent.'—

"The party so long in office has accomplished nothing, unless it be possible that the riders forced upon the act governing the management of the Panama canal—can really be in any way construed to be advantageous. The president-elect in his letter of acceptance of his nomination gave us some ringing sentences like these: 'Without a great merchant marine we cannot take our rightful place in the commerce of the world.'—'It would be a little ridiculous if we should build it (the Panama canal) and have no ships to send through it,' and his conclusion is, 'That we must build and buy ships in competition with the world. We can do it if we but give ourselves leave.'

"It is not to be expected that a candidate in his letter of acceptance, covering so many important issues, would foretell how soon we can *build* ships in competition with the world, or if we bought ships abroad how we may run them in competition with the world, even with a modified tariff, any more than the president in the midst of an important political campaign can be expected to justify the signing of a Panama canal act with riders containing legislation not germane to the subject of the act, being thus quite inconsistent with his own previous action on another bill.

"It is easy to cry, 'We cannot build ships as cheaply as abroad; alter our registry laws and let us buy our ships where we will,' but the fact still remains, we cannot run such ships in competition with the world until many other demands of our laws, times and usages have been considerably modified.

"Perhaps the party soon to come in power with its distinguished leader may with new tariffs produce results under which we may build, buy and run ships in competition with the world, and thus construct a merchant marine worthy of this great country. Such adjustment of tariffs will be pretty near complete free trade, and our country may be happy under the new conditions. Having always been a protectionist with no special interest, with only the interest of the whole country at heart, I have grave doubts, which are only increased by observation of free trade countries abroad. We must still be patient. It is evident that the president-elect recognizes the existing situation of our merchant marine, but I feel on this subject like quoting again—this time a modern poet:

> "Behold! We know not anything
> We can but trust that good shall fall
> At last—far off—at last to all
> And every Winter change to Spring."

"The one overwhelming event of the year which more than any other directly interests Naval Architects and Marine Engineers, was the loss, in April last, with its awful consequences, of the splendid Titanic, the latest work of one of the great shipbuilding yards of the world.

The Loss of the Titanic

"No previous disaster at sea, great as some have been, ever produced the consternation and appalling feeling of man's impotence than was caused by the foundering of what was considered the last word in ocean steamship construction.

"This terrible event has been the occasion of investigation at home and abroad with sundry conclusions as to the responsibility for the disaster and the need of changes in the various requirements for the future. You are aware of all that has been said and done, for a matter of such vital interest to everybody must have received from every member of this Society the closest attention and most careful consideration. You have perhaps attributed the disaster to a combination of circumstances never happening before, in which combination occurs human judgment upon which, in all walks of life, in all spheres of action, so much must depend.

"It is not our purpose now to sit in judgment. That particular combination may never occur again, and as Associate-Member Herbert L. Satterlee, in his An April Crossing, published last June, sagely says, 'The human brain cannot compute the combinations of circumstances or unusual or extraordinary conditions that may occur to the great ocean. Man may avoid many dangers, he can multiply the means of safety and methods of rescue, but he cannot annihilate the 'peril of the sea'.

"True, we cannot annihilate the peril of the sea, and we must depend in crises on human judgment. There remains for the men of our professions all the greater responsibility to make our work safe.

"Since the loss of the Titanic much stress has been laid upon the need of more life boats, and more life rafts. Indeed, as the laws now stand, it is quite within probability that there may be more life boats and rafts than can be properly and quickly handled in time of trouble.

"I have frequently gazed upon the great steamers that now cross the sea and then turned to look at the life boats. The thought that at any time one should be compelled, by stress of weather or accident, to leave the ship and put off for safety in the compar-

The Titanic's Engineers

Far below in the depths of the ship they well knew long before those on deck of the fatal hurt the ship had received. Of those directly employed by the steamship company, who were called to their places as a matter of regular duty, and of those on assumed duty in behalf of the builders, who were at the time in no way responsible for the management of the ship, not one was saved. There were many glorious examples of heroism on deck, but none more glorious, none showing greater self-sacrifice, than the examples given by that splendid engineer corps remaining below, awaiting the end without the slightest possible chance of life. All honor to those true, brave men.

atively tiny life boat seemed rather absurd. *It is infinitely more important to make the steamer itself safe than to depend upon the life boat, or, at worst, upon the life raft.* We must build our ships so sub-divided by decks and watertight bulkheads—without doors where possible—that even an injury like the Titanic's would not cause her to founder.

"Further, we must be sure that the plating shall always have such ductility that ruptures in case of severe indentation shall be reduced to the minimum.

"Do not infer that the plating of the Titanic was not of this character. Of this I have no knowledge and it is rather certain that no plating could withstand the shock caused by such a mass, traveling at so great a speed, coming in contact with a mountain; but we have seen plating so broken by collisions that warrants the statement sufficient care has not always been taken in the quality of plating used on ships.

"It will be impossible at all times to make bulkheads and decks as indicated, for such a demand faithfully executed might destroy the earning power of the ship; but there are many conditions that can be made better, and we must do what we can in designs and construction, educating owners, if need be, to at least closely approach the desired absolute safety, safety in spite of the possible fallibility of that human judgment which cannot be—and should not be—entirely eliminated.

Tribute to Engine Room Force

"One more word in reference to the Titanic—a tribute to those in the engine rooms at the time of the disaster. In our work we meet and know this class of men. Far below in the depths of the ship they well knew long before those on deck of the fatal hurt the ship had received. Of those directly employed by the steamship company, who were called to their places as a matter of regular duty; and of those on assumed duty in behalf of the builders who were at the time in no way responsible for the management of the ship, not one was saved. There were many glorious examples of heroism on deck, but none more glorious, none showing greater self-sacrifice than the examples given by that splendid engineer corps, remaining below awaiting the end without the slightest possible chance of life. All honor to those true, brave men!

"You have just elected as your president for the next term Col. Robert M. Thompson, a gentleman well and favorably known the country over as a man of great public spirit, evidenced continually by his interest in affairs national and international, and whom to know is to respect and honor. I tender him and the Society my congratulations. He can still widen the results of his public efforts, and the Society has secured a most admirable presiding officer, who will carefully watch its interests.

"Not until Dec. 31, next, will my term of office as your president expire, but practically the duties will terminate with this meeting. The council and certain other very partial friends have been kind enough to express the wish that I might continue in this office, but I firmly believe and trust that you do—that it is a very wise provision of our constitution that 'the president shall not be eligible for election as his own successor'.

"Though, as I have said, my duties continue until the end of the year, this is the time and place for me to acknowledge with gratitude the great honor you conferred upon me three years ago, an honor unsolicited and unexpected, an honor which coming from a professional society of your importance, is the highest that can be conferred upon one by his associates.

"I said on accepting the office that it would be my privilege to serve. I have not succeeded in accomplishing all of the things I hoped for. I fear no man with a proper desire for achievement ever quite does this, but I have tried to serve you well, have enjoyed the work and its attendant associations and have always received the utmost support of your council. I can ask no more. I can ask no more. I thank you one and all. I will always bear the kindest and most tender thoughts for the Society of Naval Architects and Marine Engineers."

The sessions of the Society were brought to a close with the annual dinner at the Waldorf-Astoria, the speakers being: Beekman Winthrop, assistant secretary of the navy; Hon. Wm. C. Redfield, Hon. Henry W. Hill, Hon. James W. Osborne, Elwood M. Rabenold and Col. Robert M. Thompson.

Those in Attendance

Those in attendance at the sessions and dinner were:

S. Almy, J. J. Amory, D. Almy, E. H. B. Anderson, W. Ancker, H. L. Aldrich, Calvin Austin, Roland Allwork, A. Allen, G. D. Ali, J. H. Andrews.

J. E. Bailey, G. P. Blow, M. Broady, J. D. Bouret, G. K. Bradfield, C. F. Bailey, Wm. Binley Jr., W. J. Baxter, C. F. Buckelew, J. M. Blankenship, A. E. Borie, A. H. Ball, M. K. Bowman, Jos. Barre, G. E. Best, H. I. Brisner, J. S. Blackett, H. H. Brown, Ed. Boy (commander), Burstyn (commander), F. T. Bowles (guest table), R. Blum, W. I. Babcock, G. E. Burd, C. T. Bishop, M. Buchanan, C. E. Burney, G. H. Bull.

Irwin Chase, T. M. Cornbrooks, W. L. Capps, G. Cornett, H. I. Cone, D. H. Cox, C. A. Carr, W. F. Carnes, A. W. Christian, J. M. Cherry, H. N. Covell, G. A. Christoffer, W. E. Cogkendall, J. H. Chalker, A. Collins, James Craig, Mason S. Chase, W. D. Cocks, Clinton H. Crane.

Commander B. d'Azy, H. C. Davis, F. L. DuBosque, W. D. Dickey, G. W. Dickey, W. J. DuBois, J. C. Davison, James Donald, J. E. DuBois, Geo. B. Drake, H. Dixon, W. T. Donnelly, M. W. Day, W. S. Doran, S. H. R. Doyle, H. L. Desanqes.

C. M. Englis, E. H. Ewertz, H. A. Everett, J. M. Emery, M. Edson, W. L. Ebsen, C. B. Edwards.

H. N. Fletcher, A. Fletcher, W. H. Fletcher, F. L. Fernald, H. L. Ferguson, Wilson Ferguson, H. C. Farrar, Folger, J. French, D. E. Ford, W. D. Forbes, T. E. Ferris.

J. H. Gardner, Dean Goetze, J. R. Gordon, W. A. Gilroy, Capt. A. Gleaves, A. J. Grymes, R. E. Gillmor.

J. S. Hunsaker, H. L. Hibbard, J. E. Henderson, W. N. Howell, O. Z. Howard, H. C. Higgins, Wm. Hovgaard, R. S. Haight, Robt. Haig, J. F. Hopkins, C. S. Hoyt, A. L. Hopkins, H. C. Hunter, D. Howard, F. D. Herbert, R. Hutchinson, George J. Hermiston, O. L. Halenbeck, Hon. H. W. Hill, Chas. E. Hyde, Melville Hix, R. S. Haydock, D. E. Herrick.

D. J. Irish.

H. Jobson, H. L. Joyce, H. B. James, E. P. Jessop, A. E. Jordan, J. Johannson, H. E. Jones, F. Jarka, Eads Johnson, M. Jack, E. S. Jackson.

A. A. Kennedy, J. A. Kennedy, M. L. Katzenstein, J. W. Kellogg, G. Kotter, W. Katzenstein, L. Katzenstein, L. H. Kenney.

J. S. Leslie, S. I. Leslie, J. H. Linnard, J. W. Lee, Geo. F. Lawley, L. D. Lovekin, W. J. A. London, John Loyd, A. P. Lundin, Capt. Lockhurst, Simon Lake.

C. W. McGee, J. McGrath, A. J. Garvey, A. W. Murray, T. McGovern, W. T. Moore, R. McGregor, H. A. Magoun, J. W. Miller, Ed. McIntyre, Edmund Mills, Bernard Mills, E. M. McIlvain, Spencer Miller, C. A. McAllister, J. H. Mull, G. W. Magee, R. C. Monteagle, W. H. Millard, A. Moritz, T. A. McMillan, C. D. Mosher, A. J. Maclean, W. M. McFarland, D. Methison, B. S. Murphy, J. E. Meek, C. F. Magoun, C. J. Munch, Albert Moritz, A. M. Merrill, Thomas S. Miller.

Wm. Newman, H. P. Norton, H. O. Nickerson, T. Niven, Wm. Nish, Lewis Nixon, Samuel Newton, H. F. Norton.

A. V. S. Olcott, G. A. Orrok, Hon. J. W. Osborne.

John Platt, James Plummer, E. H. Peabody, N. F. Palmer, H. L. Potter, T. P. Purdie, W. B. Porter, M. Pressy, Capt. Proctor, Capt. Platt, W. P. Pendleton.

W. S. Rogers, R. R. Row, E. H. Rigg, J. R. Raymond, R. Ramsey, T. F. Rowland Jr., C. B. Rowland, T. Robinson, R. Rayburn, G. J. Robinson, L. Ruprecht, Hon. W. C. Redfield, E. M. Rabenold, C. E. Ross, W. H. Raab.

H. C. Sadler, R. C. Scholz, B. A. Sinn, H. R. Sutphen, H. G. Skinner, F. L. Sawyer, Jas. Swan, E. A. Stevens Jr., R. A. C. Smith, C. Skentelbery, E. Snow, L. Y. Spear, W. A. F. Smith, S. K. Smith, Linden Stuart, G. Schmitt, E. B. Sadtler, George Simpson, E. A. Sperry, E. A. Stevens, B. Somers, A. R. Smith, R. Stocker, Wm. Shaw, E. P. Stratton, W. P. Stephens, R. M. Smith.

G. P. Taylor, S. P. Taylor, W. H. Todd, S. Taylor, E. W. Turnure, J. G. Tawresey, Timson, W. B. Tardy, W. A. Thompson Jr., J. K. Turnbull, Col. R. M. Thompson.

K. A. Veit, W. E. Volz, F. Van Vleck, Capt. Van Duzer, Capt. D. S. Vasselheff.

W. Carlisle Wallace, C. P. Wetherbee, H. N. Whittelsey, C. M. Wales, L. W. Walker, W. A. White, J. G. Winship, R. M. Watt, G. E. Weed, G. H. Williams, W. E. Williams, W. J. Wilgus, H. Wheeler, H. W. Warley, D. T. Warden, Hon. Beckman Withrop, H. Watrous, J. F. Whitaker, W. T. Webster, C. D. Wallace.

Commodore Yang.

NEW MEMBERS ELECTED

The following were admitted to membership during the sessions:

Members

John M. Cherry, superintendent floating equipment, Lehigh Valley R. R. Co., Jersey City, N. J.

Karl Boy-Ed, naval attache, German embassy, Washington, D. C.

Edward P. Morse Jr., general superintendent, Morse Dry Dock & Repair Co., foot of Fifty-seventh street, Brooklyn, N. Y.

Charles M. Englis, 176 Clinton avenue, Brooklyn, N. Y.

John A. Moran, treasurer, Atlantic Basin Iron Works, 20 Summit street, Brooklyn, N. Y.

Thomas F. Newman, Cleveland & Buffalo Transit Co., Cleveland, O.

Lars Brath, assistant chief draftsman, Fore River S. B. Co., Quincy, Mass.

James L. Crandall, H. I. Crandall & Son Co., Boston, Mass.

James O. Gawne, assistant naval constructor, bureau construction and repair, navy department, Washington, D. C.

Thomas M. Gunn, designer and estimator, Electric Boat Co., Groton, Conn.

Harry R. Wheeler, secretary and chief engineer, Henry Steers, Inc., 17 Battery place, N. Y.

Arthur J. Grymes, manager, marine department, Erie R. R. Co., Hoboken, N. J.

Edward Wilding, naval architect, Harlan & Wolff, Belfast, Ireland.

James H. Kurtz, chief draftsman, Cramps Shipyard, Philadelphia.

George B. Drake, naval architect, 17 Battery place, N. Y.

Charles Jackson, chief engineer, marine department, the Texas Co., 17 Battery place, N. Y.

Donald Mathieson, superintendent engineer and naval architect, W. R. Grace & Co., Hanover Square, N. Y.

Henry W. Dixon, superintendent engineer, Coast Steamship Co., 32 Broadway, New York.

Edwin S. Alexander, assistant to general manager, Newport News Ship Building & Dry Dock Co., Newport News, Va.

William Gregory Esmond, assistant chief draftsman, Lake Torpedo Boat Co., Bridgeport, Conn.

John F. Nichols, assistant chief engineer, Newport News Ship Building & Dry Dock Co., Newport News, Va.

Geo. Uhler, supervising inspector, General Steamboat Inspection Services, U. S.

Francis A. Martin, ship and engineer surveyor, with Frank S. Martin, 52 Beaver street, N. Y.

David Dutrow Thomas, chief engine draftsman, marine department, Maryland Steel Co.

Pierce J. McAuliffe, engineer in charge of construction of hydraulic dredges, Morris Machine Works, Baldwinsville, N. Y.

Christrom Hinricks, chief engineer, Seattle Construction & Dry Dock Co., Seattle, Wash.

William D. Kearfott, marine department, Warren Steam Pump Co. of Warren, Mass., 95 Liberty street, New York.

Einar L. M. Sivard, engineer, Welin Marine Engine Co., 305 Vernon avenue, Long Island City, N. Y.

Samuel Newton, draughtsman, W. & A. Fletcher Co., Hoboken, N. J.

Henry N. Fletcher, secretary, W. & A. Fletcher Co., Hoboken, N. J.

Benjamin F. Ward, superintendent engineer, marine department, New York Central & Hudson R. R. R. Co., 330 Central avenue, Hoboken, N. J.

Frederick C. Lang, president, Tietjen & Lang Dry Dock Co., Hoboken, N. J.

Henry Q. Layman, marine engine department, the Pusey & Jones Co., Wilmington, Del.

Hugh L. Tims, superintendent, Harlan & Hollingsworth Corporation, Wilmington, Del.

Irwin Chase, chief draftsman, Electric Launch Co., Bayonne, N. J.

George Eli Burd, captain U. S. navy, engineer officer New York navy yard.

William H. Raab, Robins Dry Dock & Repair Co., 15 Whitehall street, New York.

Capt. H. M. Seeley, supervising inspector of steam vessels, 701 Custom House, New York.

William J. A. London, chief engineer, Terry Steam Turbine Co., Hartford, Conn.

Associates

Harry R. Raymond, steamship manager, Clyde Steamship Co., Atlantic Gulf & West Indies Steamship Co., Pier 36, North River, New York.

William L. Chapman, secretary, Merritt-Chapman Co., 17 Battery place, N. Y.

John M. Emery, manager, marine department, Delaware, Lackawanna & Western R. R. Co., Hoboken, N. J.

Robert C. Scholz, assistant to general manager, New England Navigation Co., Pier 19, N. R., N. Y.

William H. Pleasants, general manager, Ocean Steamship Co., Pier 35, N. R., New York.

Herbert B. Walker, general manager, Old Dominion Steamship Co., Pier 25, N. R., New York.

Calvin Austin, president, Eastern Steamship Corporation, India Wharf, Boston, Mass.

Starr Truscott, draftsman, hull department, American Ship Building Co., Cleveland, O.

Alexander F. Jenkins, president, the Alexander Milburn Co., Baltimore, Md.

Maximilian Byrstyn, commander, Austrian navy, naval attache, Austrian embassy, Washington, D. C.

Alexander H. Jeffrey, manager and secretary, Polson Iron Works, Toronto, Canada.

William B. Robins, draftsman in office of inspector of machinery, U. S. navy, Cramps' Shipyard, Philadelphia, Pa.

William G. Gustafson, draftsman, Pusey & Jones Co., Wilmington, Del.

Reginald E. Gillmor, mechanical and electrical engineer, Sperry Gyroscope Co., 74 Broadway, New York.

Charles A. Christoffers, treasurer, Amalgamated Paint Co., 42 Broadway, New York, N. Y.

David C. Howard, president, DeLaney Forge & Iron Co., 300 Perry street, Buffalo, N. Y.

Newman Page, draftsman in charge of mechanical department, Electric Boat Co., Groton, Conn.

Stevenson P. Taylor, assistant engineer, Alberger Pump & Condenser Co., 123 West Eighty-fifth street, New York.

Junior to Member

Francis J. French, engineer, the Jahncke Navigation Co., New Orleans, La.

Frank E. Bagger, lieutenant, Revenue cutter service, Washington, D. C.

Dayton E. Herrick, engineer, Mosher Water Tube Boiler Co., Ossining, N. Y.

Charles W. Hubbell, production engineer, the Seymour Mfg. Co., Seymour, Conn.

William J. Norton, secretary, National Electric Light Association, 429 Home Insurance building, Chicago, Ill.

Jerome C. Hunsaker, assistant naval constructor, navy yard, Boston, Mass.

A. de Bretteville, manager, Main Street Iron Works, San Francisco, Cal.

Junior to Associate

Harry A. Musham, lieutenant, United States army, 421 Rush street, Chicago, Ill.

Juniors

Louis A. Baier, draftsman, 615 East University avenue, Ann Arbor, Mich.

Frank A. Track, draftsman, lighterage department, Standard Oil Co., 26 Broadway, New York.

Joseph J. Kam, draftsman, Electric Boat Co., Groton, Conn.

Albert Hoersch, hull draftsman, Electric Boat Co., Groton, Conn.

Walter Defriez Allen, computer, Electric Boat Co., Groton, Conn.

Revere Burnham Pulsifer, assistant in naval architecture, Massachusetts Institute of Technology.

The Great Lakes Engineering Works has taken an order for the construction of two dredges for use on the Pacific coast. They will be shipped to the coast in a knocked down condition to be assembled at the yard of Joseph Supple, Portland, Ore.

The steamer John Duncan, owned by H. J. Pauly, Milwaukee, Wis., and the steamer Pueblo owned by F. W. Smith, of Milwaukee, have been sold to Montreal parties.

John H. Dialogue & Son, Camden, N. J., have delivered a harbor tug to the Moran Towing & Transportation Co., of New York.

Fulton and Froude

Results of Experiments in Towing Made at the Massachusetts Institute of Technology

THE first paper to be read was "Experiments on the Fulton and the Froude," by Prof. C. H. Peabody of the Massachusetts Institute of Technology. The character of the paper is indicated in the following paragraph:

The objects of the experiments related in this paper are the investigation of the characteristics of tow-boats and the determination of favorable conditions. The applicability of steamboats for towing was so evident that forms and proportions were settled early in the history of steam navigation, being controlled, in part, by the ideas then prevalent concerning the action of screw-propellers and in part by the conditions of service which required simplicity and reliability in the hands of men economically available for boats of that class. The conditions of the service favor conservatism, and consequently the early types have been generally preserved, though there are instances of progressive designs that have broken away from tradition, especially for large seagoing tow-boats. The propellers used for two-boats have habitually been four-bladed, with large area and wide tips, and have had a large pitch-ratio, commonly from 1.3 to 1.5. The pitch-ratio is controlled by the use of relatively slow engines, and the form of blade according to the old ideas concerning the action of screw-propellers, especially as applied to towing. Many designers have been of the opinion that both width of blade and pitch-ratio could advantageously be reduced and, when circumstances appeared favorable, have made such changes.

Built in the Shops

The Fulton was built in the shops of the Massachusetts Institute of Technology and the machinery and apparatus used on the Froude in 1911 were transferred to her. In reading the paper Prof. Peabody supplemented it considerably, saying:

The experiments reported last year on the Froude show that when running free, with a speed of seven knots and with a pitch ratio of 1.1, the power required is 8.3 H. P. With a pitch ratio of 0.8 the power required is 8.5 H. P. There appears to be some slight advantage of 1.1. Also the experiments made with a larger pitch ratio had a certain defect, which was only discovered after the experiment was finished, namely, the propeller was set a little nearer to the stern post. The result was some loss of efficiency. This does not affect our experiments on blade area and is of no particular consequence in this condition of running free, because all of the pitch ratio would not be used.

In order to exhibit the influence of pitch, we may turn to plate Fig. 4. Here we have three curves plotted upon one diagram with three axes for ordinates. You will note that there are three points to each curve, namely, triangles and crosses and circles. The circles are for the smallest pitch ratio. It appears that there is a slight advantage for the small pitch ratio in towing which, however, I am not desirous of claiming. It is enough to say, perhaps, that pitch ratio has perhaps but little effect on towing, and that the pitch ratio, as likely to be used for ocean-going tow boats, will not produce any appreciable effect on towing.

Tug Propellers

I think the reason why such a peculiar propeller is used in tugs in this country is the necessity for maneuvering, backing, filling, accelerating and retarding the movements in getting up to the tow and getting away from it, and also to the fact that until recently the majority of tugs were made of wood, and have ponderous stern frames and enormous rudders. Every one who has experimented with tugs knows of the tremendous influence that balanced rudders, made of broad wood, have on the propeller and the efficiency of the propeller, especially in towing.

A Member:—Is not that the width ratio?

Prof. Peabody:—The area ratio is shown on plate 4. There is shown both of the influences in the diagram. The area ratio I desire to dispose of once for all. There is a slight advantage in towing for the lower ratio, which does not distinctly appear on the diagram, but it can be discerned in the reading of the paper, if you compare the results from the diagram. The influence, however, is so slight that I have no desire to emphasize it, that is, one may use such area ratio as small as 0.5, without disadvantage, doing any of the services of the boat, and that pitch ratio may vary within a range which is likely to be used, without disadvantage, especially, perhaps one may say, with a tendency to use internal combustion engines and high speed of rotation. There is probably no disadvantage in towing on account of the smaller pitch ratio which will be associated with that condition.

On the next plate, No. 5, you will find given also the thrust. You will remember, perhaps, that the thrust was measured by a mechanism which gives very direct and positive results and which I believe may be accepted with confidence. There seems to be a very considerable advantage in pulling, with a small pitch ratio, on both of the boats, the Froude and the Fulton. Here we have but 7 H. P. the pulls for the various pitch ratios, 0.8, 1.1 and 1.5, running in the order of 400, 350 and 300, that is, the small pitch ratio has a very distinct advantage. This advantage of the pitch ratio of 1.5 I think is somewhat exaggerated in this case, from the fact that the propeller was a little too near the stern post.

Plotted the Revolutions

Now, on plate 7 we have plotted upon the revolutions per minute the power, the thrust with and against the wind, and the speed with and against the wind. There were at all times during our trial very moderate breezes, but when a boat has a speed of only 7 knots, you will see that even a very moderate breeze may have some effect. In order to avoid this effect, as stated last year, when necessary we did not hesitate to run very early in the morning. We are considering, if we continue this work, running in the evening when the weather conditions are more favorable. In that case we should have to light our course, light our ranges, which perhaps we may be able to do.

Plate 8 for the towing trial of the Fulton, and Plate 9 for the pulling trial of the Fulton, I call particularly to your attention, because I wish to claim a very satisfactory condition obtained in our results as shown by the way in which the points are distributed and the accuracy with which they lie upon the curve which we have drawn. Of course, our conditions are favorable to just this kind of result.

Let us turn to the next plate, 10, "Running Trials of the Fulton." Here you will see that we have stated in terms of brake horsepower on speed, thrust on speed, and calculated resistance from the towing of the model. These several curves are pitch ratios of 0.8, unity and practically 1.3. When running free the smaller pitch ratio has a disadvantage,

which can be represented in this order: With pitch ratios of 1.3, unity and 0.8 and with 11 brake H. P., the speeds attained appear to be 6.55 knots, 6.51 knots and 6.37 knots. Briefly let us say 6.5 for the full, 6.5 for the unity, and 6.4 for the smaller pitch ratio; the difference in some duties for tow boats being entirely of no consequence.

On the next plate, 11, you will find the so-called "Towing Trial." We have here again plotted down the speed in knots, the brake horsepower, the thrust, which is quoted for information, and the pull upon the tow line. The pull on the tow line, of course, at the same speed would be the same, because the tow is not affected by the conditions on the tow boat. You will note here that these three curves lie very close together. There is a slight, but a very definite advantage for the smaller pitch ratio.

Pulling Trials of the Fulton

On plate 12 we have the pulling trials for the Fulton. We have here the scale for brake horsepower and the pull in pounds. This is the brake pull on the tow line as measured by a spring balance, under proper directions, to see that the results should be regular and that the delicacy of the spring should be sufficient for the purpose. Here with pulls at 11 H. P., with pitch ratios at 0.8, unity, and 1.3, and we have 560 at 0.8, then 545 for unity and 490 for 1.3, a very distinct advantage for the smaller pitch ratio. We have also pulls backing—in that case we could not measure the thrust. There is but little advantage lying, if anything, with the small pitch ratio, the pull backing being somewhat in the neighborhood of 0.6 of the pull going ahead. Incidentally, we tried some other matters, as on Plate 13, which is again called towing trial of the Fulton. In this case, the variant was the length of the tow line, and our habitual lengths being about two lengths of the tow boat, namely, the Fulton being 30 ft. long, we had about 70 ft. of tow line out. We ran the tow line out to various lengths, from 70 ft. up to 200 ft., and it appeared that there is an advantage of about 10 per cent in having a tow line which shall be 6.5 times the length of the tow boat, instead of something more than twice the length of the tow boat.

Plate 15 represents the results of towing with the Fulton alongside the Froude, the habitual way of handling ships in narrow waters. In that case there would be an advantage of about 10 per cent.

Now, I want to conclude with statements which I think will be of the greatest importance, next to that perhaps of disposing of the question of the use of extraordinary forms of propeller, which has come down from olden times, and that is the question of design. I want to preface it with saying that we were unable for this meeting to analyze our trials so as to determine the weight. We have the material for it, the analysis will be made, and I hope to have the privilege of presenting that to the Society. We have also in our possession experiments upon propellers quite similar to this, used on the Fulton, but 12 in. in diameter, which were tested at the model basin at Washington, up to very large slips. When this work is reduced it will be possible to approach the design of a propeller for the tow boat when towing in the same way that it can now be done when running free.

John Reid:—The only reason that I am before you is that I think Prof. Peabody's conclusions are sometimes erroneous. I would like to call attention to the extraordinary statement which Prof. Peabody has made, and that is that from his experience with these experiments the internal combustion engine can be fitted into a tug and that the consequent high revolutions of the propeller would have very little effect upon the efficiency of the boat as a tug. I have had a little experience with that in the last twelve months, and I can inform Prof. Peabody, so far as my experience goes, he is hopelessly out of it. It all depends on what you expect a tug to do. As a branch of naval architecture the designing of tow boats would be a specialty for any man, no matter how clever. If you go to Europe, to Germany, to Holland, to Canada, you will find the tugs are utterly different, and that they are used in entirely different ways, and if you attempt to take a British tug and use it in America or a Canadian tug and attempt to use it somewhere else, you will have lots of fun on your hands. I have tried it and know.

I do not hesitate to say, so far as my experience in tugs has gone, and I have had about six built in Canada in the last few years, if you want to get assured success, you want to keep the revolutions somewhere around 120. If you get above that, you will get into trouble.

One of the troubles that any designer has to face in studying a paper like Prof. Peabody's is simply this: That, however he may agree with Prof. Peabody's findings, you cannot always convert them into practice, because you have got to take a certain size of hull, and get a certain size of engine, because the engineer has used that engine, and take a certain kind of propeller, because the man on board is familiar with it, and wants one with which he is familiar.

Peculiar Propellers in Tugs

I think the reason why such a peculiar propeller is used in tugs in this country is the necessity for maneuvering, backing, filling, accelerating and retarding the movements in getting up to the tow and getting away from it, and also to the fact that until recently the majority of tugs were made of wood, and have ponderous stern frames and enormous rudders. Every one who has experimented with tugs knows of the tremendous influence the balanced rudders, made of broad wood, have on the propeller and the efficiency of the propeller, especially in towing.

W. H. Hovgaard:—The experiments described in this paper will undoubtedly be of great value to the designer of towboats, but wish to draw attention to the fact that they will be of equally great value to the designer of ice-breakers.

As far as the propeller design is concerned, the two problems are about identical. In both cases it is required that the propeller shall develop maximum power under circumstances to where a great resistance reduces the speed to a very low figure.

I have had some practical experience in the design of ice-breakers and of propellers for ice-breakers, and it is a satisfaction for me to see that these experiments corroborate the opinion which I have always held and advocated, that the propellers of ice-breakers, should preferably have a low pitch ratio. I met considerable opposition in this view of mine on the ground that the high pitch propeller shows up better on the speed trials in free water. It seemed desirous to me that a propeller which worked under the most favorable slip at full power and high speed in free water, can not possibly work to best advantage at nearly the same power when the speed is very much reduced, because the slips will then become excessive. With a low pitch ratio, a high number of revolutions, and maximum power may be maintained with good efficiency; i. e., a high thrust at even very low speeds.

Clinton H. Crane:—I think that all of us in this society have got to

Experience In the Paper

I was prepared to have any of my statements objected to and to take any castigation with the proper meekness of spirit, but if any man stands up and says we do not know what we are doing, because we are scientific, and he does know because his experience is contrary, I will say that there is more experience in this paper with regard to what you can do with towboats than almost any man has ever had for the reason that those people who have had long experience have had only one type of towboat which they could handle in the way in which it is designed, and could not do anything else with it.

appreciate a scientific investigation of any problem. I think all of us who have to do with the designing, building and handling of tug boats, realize that there is less information, scientifically, about a tug boat than about any other type of boat.

Steel Tug Boats

Some years ago we were called on to design a tugboat for the Brooklyn Eastern Terminal. They never used anything at all but wooden tugboats. There was a man in the place who would not have anything to do with a steel tugboat, because a wooden tugboat "towed better." He was asked "Why does a wooden tugboat tow better?" He replied, "I don't know, but I have been on the Smith, and know that she is better than any towboat in the harbor." I made a great many trips on the wooden towboats and looked in the steel towboats, and we finally built a steel towboat. When that towboat was finished none of the men in the yard thought that she was doing work equal to any of the wooden boats. We said, "All right, let us run a comparative test and let us see what the boats will do." We did so, and found that the steel towboat was doing 10 per cent more work than any of the other boats, but, all the same, old shell backs were not convinced. My experience with towboat propellers is that the general idea is that unless you put on a square tip, high pitch ratio propeller, it is no good. I have personally been convinced for a long time that a low pitch propeller would tow better. It is absurd to use a slip of 60 or 70 per cent when you do not have to, and yet the times when we put on low pitch ratio propellers, and we tried them several times, they have never been a success. It is perfectly fair to say that a low-pitch ratio will not handle the boat as well as a high-pitch ratio. It will not get the power to her as well, nor stop the boat as well, nor turn her as well—just why that is I have not been able to determine to my own satisfaction, and I rather hoped that Mr. Peabody, in his experiments, had made some handling experiments which would help us in that analysis.

W. T. Donnelly:—As to this matter of handling, when the tow boat is started up, there is a surplus of power. The engineer and the captain may not realize it, but the boat has been storing power, and I call attention to the fact that all of these tests given by Prof. Peabody show an economy relative to the power used. The captain has no sympathy in the matter of saving power, particularly when he is starting up, or doing other work, and while his propeller may be very much more inefficient, it may be a more serviceable instrument for that time, when he can disregard all questions of economy, and look only for questions of securing a given result.

As has been said by the last speaker, there is no question but what a large pitch handles the boat quicker and better. We can understand that readily, because it will absorb much more power for handling a larger quantity of water in a short time. There is certainly no question that as engineers we must weigh and measure to determine the units we are using, so as to predict a given result. We cannot predicate a result on the experience of any one man.

C. H. Peabody:—I was prepared to have any of my statements objected to and to take any castigation with the proper meekness of spirit, but if any man stands up and says we do not know what we are doing, because we are scientific, and he does know because his experience is contrary, I will say that there is more experience in this paper with regard to what you can do with towboats than almost any man has ever had for the reason that those people who have had long experience have had only one type of towboat which they could handle in the way in which it is designed, and could not do anything else with it. We can do anything we please with our towboats. Consequently, with these model towboats we have been able to have experience which nobody else has had at all; and it is experience, not scientific work, in a certain sense. Any one who says a thing will not go should be able to present experience to the contrary. If it is said that 300 r. p. m. will not do and 120 r. p. m. must be taken, I wish to say until it is proven that some one cannot use 300 r. p. m. and make a boat which will handle just as well, and perhaps better, the first statement must be held in abeyance.

Maneuvering in Narrow Waters

As for maneuvering in narrow waters, and as to whether a slow revolution will maneuver better than a higher revolution, we have not any information on that point. I believe the reason why a high area pitch ratio boat handles better is because the engine is a slow engine, and if it runs away it will not run away hard enough to hurt anybody.

I am glad to find that from his txperience, my colleague, Capt. Hovgaard, is in favor of the low-pitch ratio. I will say that we have taken a lower pitch ratio than we probably would ourselves advise any one to use, as we desired to cover the range so as to take in the entire field of inquiry.

I find that the statements by Mr. Crane, which I most heartily appreciate, are somewhat along the lines of what has been told to me by certain towboat men, that they will take off one wheel at the solicitation of the towboat captain and put on another wheel, and that he will report that the boat is doing very much better. I have known of an instance where they took off a wheel and put it back again, and the towboat was said to be doing very much better.

Traffic of Suez Canal

The traffic of the Suez canal last year showed an increase of 1,742,896 tons as compared with 1910, and an increase of 2,917,267 tons as compared with 1909. The gross receipts last year were the highest yet recorded—viz., $26,950,000, as compared with $26,080,000 in 1910, and $24,125,000 in 1909. Last year's increase is rendered all the more remarkable by the fact that some reduction in transit dues was made during the 12 months. The number of vessels which passed through the canal last year was 4,969, as compared with 4,533 in 1910, and 4,239 in 1909. Of these vessels, 3,089 in 1911, 2,778 in 1910, and 2,561 in 1909 carried the British flag. The tonnage of German vessels has also increased from 2,381,681 tons in 1909 to 2,563,749 tons in 1910, and to 2,790,963 tons in 1911. The average time occupied by vessels passing through the canal last year was 17 hours, one minute, as compared with 16 hours, 54 minutes in 1910. The proportion of vessels navigating the canal by night as well as by day last year was 96.4 per cent, as compared with 97.8 per cent in 1910. As from Jan. 1, 1913, the transit dues imposed on vessels passing through the canal will be reduced to 5s per ton for loaded ships, and 3s per ton for vessels in ballast.

The Fore River Shipbuilding Co. has received contracts to build two steel railroad car floats and three steam trawlers. The floats are for the New York, New Haven & Hartford Railway Co., and the trawlers are for the Bay State Fishing Co., of Boston.

The steamers H. P. McIntosh and Gen. George A. Garretson, of the Gilchrist Transportation Co.'s fleet, have been sold to the Wilson Transit Co., of Cleveland, for a consideration of $450,000. They were built in 1906, and are 550 ft. over all, 530 ft. keel, 54 ft. beam and 31 ft. deep.

Barge No. 83, building for the Standard Oil Co., was launched from the Cleveland yard of the American Ship Building Co., on Nov. 9. The barge is 260 ft. over all, 250 ft. keel, 43 ft. beam and 23 ft. deep, having capacity for 1,000,000 gallons of oil.

Bureau of Construction

Naval Constructor Robinson Describes the Methods of Handling the Work of Design

THE second paper to be read was "The Design and New Construction Division of the Bureau of Construction and Repair of the Navy Department," by Naval Constructor R. H. Robinson. The paper dealt only with the methods of handling an organization engaged in design and in passing on matters of new construction, leaving the work produced to speak for itself.

Joseph H. Linnard:—On page 23, of his paper, Mr. Robinson remarks, "One of our most difficult problems arises from that fact that until our naval bill passes we never know what the program for the year is to consist of." Many of the members of this society may be unaware that for several years past every naval appropriation bill providing for an increase of the navy has at the same time contained a positive prohibition against using any of that money appropriated for the increase of the navy for the design of the vessels. It is in connection with other appropriation bills, limited to a specific fixed sum, which has not been increased in any material way for a number of years, that the number of employes, both draftsmen and clerical, who can be used in the navy department in Washington are fixed. As you all know, the work devolving upon the navy department in connection with not only the designing of ships, but the running of them and their management, has enormously increased in many years past, and the problem that Mr. Robinson and others has been up against has been how to accomplish this greatly increased work with the same force of draftsmen and clerical employes.

Studying of Processes

As Mr. Robinson has explained in his paper, success has been reached through the employment of methods, the studying of the processes of work, which have been frequently called by that much abused term "scientific management," but this is a case in which the management and arrangement, and studies which have been made in the work, which have produced such remarkable results, have been made with the same working force, so that the criticism sometimes made against "time studies" and others, that while reducing in certain directions it brings in additional employes of one kind and another which offset the saving supposed to be made, cannot apply here, because we have not been able to increase the force, and therefore, I thought I would make it clear to you that these studies to which Mr. Robinson referred, have produced more work with the same force of employes, and therefore they could not be considered otherwise than as a success.

Homer L. Ferguson:—Mr. Robinson very modestly says that he would leave the results of the work which he has been doing in Washington to be judged by others. This question which he has brought up and discussed has particular interest to people in our business, I take it, in two ways; one is in the results produced, which have been most excellent. I do not think there is any draughting or office force in this country, either in the government service or outside which in efficiency and in promptness and in actual knowledge of what they are doing exceeds that of the force under Mr. Robinson, and those of us who do business continually with various governmental departments and with various organizations outside know that work which goes there is dealt with most promptly and most effectively, and if you get turned down it is done emphatically and at once without holding you up for a long time. I think that the results in that direction have been very remarkable, and I regret to state, in a way, that most of them have been accomplished since Mr. Robinson succeeded me in the job.

Room For Improvement

As indicating what can be done with an office force, I think it is very instructive to any one who is interested in scientific or common sense, or any other form of management which, of course, is what all of us who are trying to manage something should continually try to do — we should try to do things in an easier and better way, and with more method, and in my humble judgment there is greater room for improvement in most offices, in most drawing rooms, than there is in most work. In my experience, my efforts at scientific management have usually been aimed at correcting the evil habits of some one outside of the main office, and I believe that is the proper place to begin.

Richard M. Watt:—Naval Constructor Linnard omitted one rather important phase of the subject, and that is to have appropriation bills made sufficient in size—they seldom vary in numbers or types of ships as was evidenced by the last appropriation bill, and as chief constructor, I desire to express my appreciation of the system which has just been described, for under the able administration of Naval Constructor Robinson, it is unquestionably producing results.

R. H. Robinson:—With regard to what Mr. Linnard said, I may say that we have one less employee now than we had ten years ago, so that his statement is correct. As a matter of fact, our money expenditure is the same now, but we have distributed the expense of one man over the balance of the force. The original reason I had in mind in preparing this paper was because I am very much interested in system, and while I have a very small force to organize and manage, I spend most of my spare moments in doing that, and I put it down here in the hope that in the years to come other people would give a statement of what they had been able to do. I believe there are two important parts of the engineer's business, one is the technical and the other is the managerial, and when I get tired of one, I turn around and do the other, and any information which may be contained in this paper is simply the result of the compilation of things which may be applicable to the case in point.

A Curious Case

The master of the Italian passenger steamship Principe di Premonte was recently fined for disobedience of the provisions of the passenger act of the United States, in that his ship was not provided with proper tables and chairs for the use of the steerage passengers. Capt. Demeniconi argued that the steerage passengers whom his vessel carried, being Italians, had no use for tables and chairs, as they preferred to eat their meals seated on the deck of the vessel. The court agreed that the master was right in his contention, but it held that the obligation of the act of congress was absolute, and that the law having been broken in that tables and chairs had not been provided for those who admittedly had not use for them, the defendant must be punished. And punished he was, with a fine of $10 and fifteen minutes' imprisonment.

The Kansas City Missouri River Navigation Co. is transforming its oil-burning steamers Kansas City and St. Louis into coal burners.

Engineering Progress in Navy

Capt. Dyson's Paper Evoked Extremely Lively Discussion Among the Members

THE third paper read was Capt. C. W. Dyson's paper on "Engineering Progress in the United States Navy". The points touched upon in this article, which provoked the widest discussion, were as follows:

(a) General character of the service which the vessel will be called upon to perform; whether she must keep the sea for long periods, cruising at speeds very much lower than her maximum speeds, or whether she will be called upon for very little slow cruising, but shall be held in readiness for dashes at high speed from a base to any threatened point.

(b) Greatest economy realized at the conditions under which she will be called This point is imupon to operate. portant, not only from the point of financial saving in reduced fuel cost, but in the greater case of fuel supply due to the decreased demands.

(c) Fuel capacity entailed by the demands of the service to which the vessel may be subjected.

(d) Ease of up-keep of the machinery, and degree to which the vessel, so far as machinery repairs are concerned, can be made self-supporting.

(e) Reliability of machinery when driven at high powers.

(f) Minimum weight and space required for the propelling machinery.

(g) Efficient propellers for maneuvering.

(h) Minimum of vibration of hull due to machinery in operation.

(i) Effect of vertical position of center of gravity of the machinery upon the time of roll of the vessel, in fixing the quality of the vessel as a gun platform.

Rear Admiral Harrison I. Cone
Engineer-in-Chief United States Navy

Admiral H. I. Cone:—In connection with the statement, "This system, as applied to the destroyers, depends entirely for its gain upon the greater efficiency of the reciprocating engine at the higher steam pressures over the efficiency of high pressure turbined of the reaction and the high-pressure nozzles of the impulse type of turbines, no advantage being gained from increased efficiency of propellers, as the reciprocating engines are on the same shaft as the turbines. From some points of view this combination is undesirable, and the gain in service must be considerable to justify its retention." I do not know when this was written. Since that time that has been tried in service and it has met everything that was expected of it.

Charles G. Curtis:—In view of the fact that every important nation except the United States is now building turbine battleships exclusively, and of the fact that the improvements of the last few years have been such as to cause the most responsible builders here and in foreign countries to put forward figures of low power economy on a par with the results shown by our reciprocating battleship, Delaware, the views expressed in Captain Dyson's paper just read are most interesting, and to me somewhat surprising.

With many of Captain Dyson's conclusions I heartily agree. I cannot, however, agree with his conclusion that the reciprocator is preferable to the turbine for the kind of battleship under construction—a view which is opposed to those of the best naval engineers in other countries.

In giving my reasons for the opposite view, I wish simply to put on record the facts and figures, stated as correctly as I am able to give them, realizing that whatever I may say on the subject will probably be regarded with more or less prejudice because of my connection with an interest in the matter. On this account I invite criticism, particularly from our navy department. On the other hand, Capt. Dyson has been the originator and developer of the most important improvements that have been made in marine engines in recent years. These improvements, though not generally appreciated, are all the more striking because of the belief long existing that progress in the direction followed by Capt. Dyson was not possible. Not only is

Capt. Dyson entitled to great credit for his important contributions to the art, but in view of his success it would not be unnatural if he should have a slight unconscious leaning towards the engine rather than the turbine.

Comparative Data

In Capt. Dyson's paper he compares the engine-battleship Delaware with the turbine battleship North Dakota, in regard to coal consumption, the former representing the type of engine which has been carried to our high state of development with remarkable results by Capt. Dyson himself, the latter representing a type of turbine which was new, and which had undergone practically no development at that time. When the North Dakota's turbines were designed—about six years ago, but little importance was attached to economy at low speeds. The builders were not asked to make any effort in this direction, and the turbines were designed simply to meet the actual guarantees called for by the department. These and the results obtained on trial were as follows:

WATER PER HORSE POWER INCLUDING SHAFT HORSE POWER OF MAIN TURBINES AND INDICATED HORSE POWER OF ENGINE ROOM AUXILIARIES.

	Guarantees.	Actual trial results.
At full power	15.1 lbs.	13.48 lbs.
At 19 knots	16.1 lbs.	15.37 lbs.
At 12 knots	23.2 lbs.	22.88 lbs.

The turbines thus met the guarantees in all respects, and were duly accepted. The excellent results at low speeds subsequently obtained by the Delaware which were largely due to the improvements introduced by Capt. Dyson were not then anticipated, at least so far as we know.

I have no doubt that Capt. Dyson used the North Dakota's results for comparison with the Delaware, because there is no other battleship equipped with this type of turbine in this country, and I have such faith in Capt. Dyson's fairness that I feel sure he had no intention of making an unfair comparison. Nevertheless, the comparison is, in my judgment, quite unfair, and should not be considered except in conjunction with the improvements that have been made since that time.

Last winter a battleship was awarded to the Fore River Co., which will be equipped with a more highly developed form of Curtis turbine, designed to give much higher economy under all conditions, particularly at low speeds. I believe, therefore, it will be illuminating to analyze the probable performance of this new ship, called the Nevada. Instead, however, of comparing one ship directly with another, which is always unsatisfactory where the models and the speeds are different, I will make the comparison between the old North Dakota and an assumed or new North Dakota, exactly like the old ship except that it is to be equipped with turbines and screws like those which are going into the Nevada. Such an improved North Dakota will be better than the old ship; first, because the turbines will be more efficient, that is, they will require less steam to develop the necessary shaft horsepower; second, because the screws will be more efficient for the reason that they are larger and slower turning, that is, they will require less shaft horsepower to develop a given speed of ship.

Plate (1) shows the actual water rate curve of the main turbines of the North Dakota at different speeds of ship obtained on the official trials, (no auxiliaries being included). It also shows the expected water-rate curve of the improved turbines for the new North Dakota under exactly like conditions except at low revolutions. It also shows the per cent gain in efficiency of the new North Dakota's turbines.

Plate (2) shows the number of heat units necessary to furnish the steam used by the turbines of the North Dakota and the engines of the Delaware. These curves are obtained by taking the actual water required by the main engines alone and multiplying by the total heat in the steam taken between the hot well temperatures and the initial temperatures. The auxiliaries in this comparison have been expressly excluded, because it so happened that in the case of the North Dakota the official trials were made with fewer auxiliaries than was the case with the Delaware. In order to make a fair comparison therefore, it is necessary either to exclude the auxiliaries or to assume an equal auxiliary consumption in both cases. I have thought it simpler to exclude them.

An Improved Dakota.

I will make the comparison between the old North Dakota and an assumed or new North Dakota, exactly like the old ship except that it is to be equipped with turbines and screws like those which are going into the Nevada. Such an improved North Dakota will be better than the old ship; first, because the turbines will be more efficient, that is they will require less steam to develop the necessary shaft horsepower; second, because the screws will be more efficient for the reason that they are larger and slower turning, that is they will require less shaft horsepower to develop a given speed of ship.

The third curve on plate (2) shows the heat units that would be required by the turbines of the new North Dakota operating under the same steam conditions as the old North Dakota. This curve is obtained by multiplying the product of the water-rates and the shaft horse powers for the new North Dakota by the same heat values as in the North Dakota. That is, the curve for the new North Dakota is based on the same initial steam conditions and same hot well temperatures as the curve for the North Dakota, and the improvement shown is due partly to the gain in turbine efficiency and partly to the gain in propeller efficiency. The improvement in propulsive efficiency has been assumed to be 10 per cent at all speeds. At the bottom of plate (2) is a curve showing the per cent excess heat units required by the Delaware over the new North Dakota.

It will be observed that the Delaware at 21 knots requires 18 per cent more heat units than the new North Dakota, at 18 knots 12 per cent more, at 16 knots 5 per cent more, and below 14 knots the consumptions are practically equal.

This means that the new North Dakota could either have her boilers cut down 15 per cent, or her turbines could develop 18 per cent more effective or push horse power with a given amount of steam. Allowing for an auxiliary consumption equivalent to that of the Delaware this increased horsepower would give the ship an increased speed of ½ knot. In practical working, however, the turbine, because of the fact that it can safely be forced much higher above its normal capacity than the engine, can utilize more steam and can therefore develop a great deal more horsepower. With such a steam generating capacity as our battleships are now provided with, the turbine ship could be driven at least a knot and probably a knot and a half faster.

Battle-Cruiser Princess Royal

In this connection, I draw attention to the *Scientific American* of Nov. 16, which states that the British battle-cruiser Princess Royal in her recent trials showed a mean speed over the measured mile of 33 knots, and a speed of 32 knots on the eight-hour full power trial. This is 4 knots above designed speed. This ship has a displacement of 26,300 tons, about the same as that of our last battleship, but is somewhat longer, being 660 ft.

Whether these curves are trustworthy or not depends, of course, upon whether the expected improvements in both propulsive efficiency and turbine efficiency will be realized. Regarding the first point, experience had with screw designs since those of the North Dakota were made shows that their design can be materially improved, even without changing the revolutions. I understand that new screws designed by the navy department have recently been tried on the North Dakota, and that the pre-

liminary reports show a considerable improvement in efficiency. The expected gain due to better design, combined with lower revolution has been arrived at after consultation with Capt. Dyson and his assistant, and I believe that the figures of gain assumed are regarded as quite conservative.

Concerning the expected gain in turbine efficiency, a fear has been expressed that sanguineness may have induced expectations that cannot be reached. In answer to this I will state the ground on which the expected improvements are based.

First. In the old North Dakota turbines there are 28 moving rows of buckets. In the new turbines there will be 97 rows, although the peripheral speed is somewhat less in the latter, the efficiency is certain, judging from previous experience with actual machines, to be much better.

Methods of Calculation

Second. The methods of calculation employed in arriving at the figures are founded upon constants which have been used extensively in this country and Germany, and also in England and France, and which have been shown to be reliable by application to many different types of turbines. The correctness of these methods has been confirmed by an immense practical experience in these countries with both the Curtis and Parsons turbines, including marine types.

Third. The results shown by a cruiser having turbines very similar in character to those under consideration, but of less horsepower, which were tested with great thoroughness during the builders' trials of the vessel several years ago. At 14.2 per cent of full power (corresponding with 12 knots) and a peripheral speed of 73.5 ft. per second, the expected water-rate in the case of the new North Dakota is 16 lbs. Under similar conditions, but at considerably lower peripheral speed, and with fewer rows of buckets, the cruiser turbines show a water-rate of 17.1 lbs. At the same peripheral speed, they would have shown a water rate fully as low as 16 lbs. The results shown by these cruiser turbines would of themselves seem sufficient to warrant full confidence in obtaining the results expected.

Fourth. Within the last year a number of large battleships have been ordered by some of the most advanced nations to be equipped with Curtis turbines of a similar character. In England a large battleship cruiser of 87,000 H. P. has recently been ordered fitted with Curtis turbines quite similar in character, and involving figures of economy quite as low relative to the conditions as those now proposed. As already stated, responsible builders have for some time been offering designs with assurances of economy at low power for battleships similar to that now under discussion, practically on a par with the figures shown by the Delaware.

Fifth. With four shaft arrangements still better economy can be obtained.

I do not mean, of course, to predict that the exact estimated figures will be obtained. Every experienced engineer knows that in a machine of this kind results may come out a few per cent one way or the other, but even if they should fall short of expectation by say 5 per cent of full power—or 10 per cent at low power, such a possibility can hardly justify discarding the decided advantages of the turbine due to its higher full power efficiency and its greater overload capacity and reliability, nor can it justify, it seems to me, the discouragement and set back in turbine development in this country which is bound to result if the next battleship is equipped with engines.

In my judgment the best form of propelling machinery for the next United States battleship would be straight turbines either in a two, three, four-shaft form, combined with small cruising geared turbines, which would be used only at low power, and on long cruises where economy was important. When these were in use the steam would pass first through the geared turbine, and then through the main turbines. A very large gain in economy, at least 25 per cent, can be had in this way at speeds in the neighborhood of 10 or 12 knots. The horsepower to be transmitted by each gearing would probably not exceed 700 or 800, and the art of turbine gearing has already reached a stage where the practical success of such an arrangement in a battleship is reasonably well assured. In England over 100,000 H. P. of geared marine turbines are built or building, and in this country a considerable number of geared turbines are now in operation, driving electric generators, and a much larger number are building. If any objection should be found to the geared turbines in service, they could be dispensed with, and the ship would still be a better proposition, all things considered, than if she were equipped with a reciprocating engine.

Curtis Turbines.

Within the last year a number of large battleships have been ordered by some of the most advanced nations to be equipped with Curtis turbines. In England a large battleship cruiser of 87,000 H. P. has recently been ordered fitted with Curtis turbines quite similar in character and involving figures of economy quite as low relative to the conditions as those now proposed. As already stated, responsible builders have for some time been offering designs with assurances of economy at low power for battleships similar to that now under discussion.

Holding Power of the Propellers

I entirely agree with Capt. Dyson that in all previous turbine vessels the propellers used have been altogether too small, and the result has been that in adverse conditions of wind, sea or ships' bottom not only does the efficiency fall off materially at high power, but the slip of the screws becomes so great that their holding power is quite inadequate. In our last battleship, the Nevada, arrangements have been made to use propellers having a disk area about 18 per cent greater than those of either the North Dakota or the Utah. I would, however, strongly advise using still larger propellers turning at a still slower speed. This would involve some loss in turbine efficiency, but it would be almost entirely made up by a gain in propulsive efficiency, so that the net result would be but little inferior to the present arrangement. Probably the difference would not exceed one or two per cent at full power and three or four per cent at 10 knots. This would give a much better and more manageable ship under all conditions not only in going ahead but in backing. On a ship like the Nevada, I should advise using propellers at least 40 per cent larger in disk area than those used on the North Dakota, and turning at not over 200 r. p. m. for full power.

The backing power, or more properly speaking, the efficiency of the turbines when backing, has in the case of the Nevada been largely increased over that of the North Dakota, so that this ship will undoubtedly be an entirely different proposition in this regard. With the steam flow equal to that used at full power ahead, and at 80 per cent of the full speed revolutions, the backing horsepower of the Nevada will be about 55 per cent of that developed at full speed ahead. Since a great deal more steam can be passed through the turbines than is possible with the engine, this can be increased at leat 50 per cent so that a backing power as high as 70 or 80 per cent can be obtained, for short periods—as long as the boilers can furnish the steam.

William L. R. Emmet:—In the discussion of methods of propulsion I want to take an annual opportunity of saying a word for the electrical method. In the last few months we have taken larger units for the collier Jupiter, being built at the Mare Island yard, and we have obtained from that generating unit the exact result which I predicted on it—was considerably better than what we

guarantee on the ship. During its completion, however, we have learned some things about turbines, and I have arrived at the opinion that we could get very much better results by certain changes, in a somewhat modified form, by retaining a portion of the turbine which we already had, that is, in putting the new low pressure end on it. That machine was tested last week, and it has given the best economy of any engine ever produced for any service. In over 5,000 lbs. output we have 72 per cent efficiency of saturated steam, and the water-rate of the Jupiter, although it is only 190 lbs. pressure, and saturated steam was 28.5 vacuum, will be 11.1, which I think is about at least 3.5 lbs. better than the best locomotive engine driven, especially under such conditions of steam.

Nine Rows of Blades

This machine, instead of having so many rows of blades, and all these things which have been spoken of here by Mr. Curtis, has only nine rows of blades, and its length is only a little over 4 ft. Its diameter is about 5 ft., it is an extremely small thing, any part of which can be handled and got at, and it is extremely simple, and its parts are large and rugged. In speaking of methods of propulsion, all that I enumerated is that due attention should be paid to the characteristics incident to the best propellers and also to the characteristics incident to the best turbine speed. This new turbine, the Jupiter, is a high speed machine, which runs at 2,000 r. p. m., and it is a very distinct advance in prime movers over anything ever produced before. The merit incident to the best propeller speed and also the merit incident to the best turbine speed, which obtains in this machine to which I have referred, should be carefully weighed as against the characteristics of other prime movers of different speeds, but it is the best we know how to do. With electrical propulsion, we select the best propeller speed, and there is a great difference in economy due to the best selection, as we all know, as has been shown on the floor of this meeting. The question is how shall we get these best speeds, and what can we afford to sacrifice in order to obtain approximations to them? With certain types of turbines you can produce very good results if the speeds are not too extremely low, that is, with certain improvements of speed in the existing marine turbine you can make it very much better, and the aim of Sir Charles Parsons and others who have worked intelligently on the theme of gearing to ships has been in the direction of, by a moderate and reasonable speed reduction, getting a very good turbine, at the same time, retaining a pretty good propeller speed. I have nothing in the world to say against this. I have experimented successfully on gearing a good deal myself, and I think that it is a very hopeful thing, but until we can have big enough ratios of speed reduction, it is not justified as compared with electricity, because the electrical equipment is extremely simple, extremely light, and has a high efficiency, which is perfectly well known and which is absolutely unquestionable.

The efficiency of reduction in the apparatus on the Jupiter is 92 per cent, that is there is 8 per cent loss of electricity. Now, if you study the curves of propeller performance, you will see that small concessions in the matter of propeller speed can be made without losing more than that. From such data as I have been able to obtain concerning gearing, I do not see how a ship like the Jupiter could be properly propelled, with proper propeller speed and turbine speed, unless you use double reduction, and double reduction is a complication. Therefore, my plea for electrical propulsion is that it gives you the rate of speed you want, something we know about, and you do not have to look into the future at all. I simply say that the propulsion of ships by the methods now used is absolutely not justified in the light of the performance the Jupiter has made, and that is a remarkable piece of apparatus, and the means of speed reduction are thoroughly well known.

Electrically Propelled Ships.

While it may appear to many that all this talk about the electrical propulsion of vessels is a waste of time, I just want to say that there is a great deal of attention being devoted to this subject and in spite of all contrary opinions that have been expressed, there will be a great many electrically propelled ships soon. The subject is being seriously considered by many large ship users abroad and is being more and more thought of here. It is a thing which should be considered simply on its merits, but if these merits were carefully considered I think they will be conceded to be rather large.

In the methods of electrical propulsion designs, which I have made, and which have been published in papers which I have read, they show certain equipments, which the developments of recent times has enabled us to considerably simplify, so that the electrical end of ship propulsion is simpler than it was when I wrote those papers. Means have been devised in connection with the driving of locomotives, in which we need a very wide torque in securing the necessary starting power. In running electric locomotives a method of designing alternating current motors has been developed which has a characteristic, by the use of induction in the rotor, of making the rotor so that it will give a high torque only out of synchronism with the generator and will give good efficiency when it is in synchronism. This gives us the quality which we need in ship propulsion. This rotor is so constructed that its windings present a high resistance to currents of high frequency and a very low resistance to currents of low frequency. When the motor is at a speed nearly synchronous with the generator the effective resistance of rotor winding is low and the motor is virtually as efficient as a motor of the ordinary type assigned for small full load slip. When the motor departs from the nearly synchronous condition, as in the act of reversing, the self-induction of the rotor winding causes the bulk of the current to change its path, and to act through channels of high resistance, so that a high torque is maintained, as would be the case if a considerable resistance were actually switched into the rotor circuit.

By that method we can use a motor without external resistance, and that is a very great simplification, because there are no connections to be made, and the ship can be operated by simply throwing switches without interruption of service. If I were re-designing the Jupiter equipment, I would have it arranged to be handled exactly as a locomotive is handled, by moving a little controller, so that I could stop the ship, or start her, or reverse her, and do everything that is necessary to be done through electrically controlled switches, and the opening and closing of those switches would be the only thing that would have to be done in connection with the whole manipulation of the vessel.

Many Electrically-Propelled Ships

Now, while it may appear to many that all this talk about the electrical propulsion of vessels is a waste of time, I just want to say that there is a great deal of attention being devoted to this subject, and in spite of all contrary opinions that have been expressed there will be a great many electrically-propelled ships pretty soon. The subject is being seriously considered by many large ship users abroad, and is being more and more thought of here, and it is a thing which should be considered simply on its merits, but if those merits were carefully considered, I think they will be conceded to be rather large.

Ernest H. B. Anderson:—I wish to thank the previous speakers for their remarks about gearing, because all the successful applications of turbine gearing have been carried out by Sir Charles Parsons, and our experience with geared turbines has shown remarkable economy of steam consump-

tion and great success has been achieved with two destroyers, two channel steamers and cargo boats. It may be of interest to you to know that there is upwards of 100,000 H. P. of Parsons geared turbine machinery built and under construction.

Walter M. McFarland:—Does the gentleman dispute absolutely the statement made in Capt. Dyson's paper, that the gearing on the Neptune is running successfully?

Ernest H. B. Anderson:—All I wish to say is that the successful application of mechanical gearing in modern vessels has been carried out by Sir Charles Parsons.

As regards a comparison between the trial results of Florida and Utah, I do not agree with the author that the efficiency of the propellers in the former ship fell off greatly, due to adverse weather conditions. To illustrate my meaning, I have plotted the trial trip standardization curves of speed and revolutions for both these ships. The two curves are very much alike. This is shown by Plate A.

Trial Trip Conditions

As you probably know, trial trip conditions vary so greatly that I do not consider it anything out of the ordinary that the Florida required more revolutions for the same speed, even though the propellers of both these ships are of the same dimensions. My opinion is that this difference is largely due to the finish of the propeller blades, and it is possible that the blades of Florida wheels are thicker.

In addition, Florida made new speed records for United States battleships, on the standardization trial 21.952 knots against Delaware 21.44 knots. Further, on the four-hour full speed trial Florida 22.08 knots against 21.86 knots for Delaware. Utah on final acceptance 21.92 knots for four hours, driving against a heavy breeze.

Plate 1 shows curves of I. H. P. and S. H. P. on a basis of speed for Delaware and three turbine ships. My view is that the shaft horse power figures are practically valueless, due to the fact that torsion meters are so erratic. Also, various types of torsion meters have been tried by the navy department, which accounts largely for so great a variation in S. H. P. data of turbine ships.

A more accurate method of comparison is arrived at by basing water consumptions of machinery on the effective horse power results obtained with the models of vessels pulled in the experimental tank. This was our regular practice before the advent of the torsion meter.

The curves on plate 2 are based on total water consumption of machinery "as measured" during the builder's trial trips. I do not consider that the Delaware and the Utah can be compared accurately on an equal basis in this manner. The following list gives the total steam consumption of the auxiliary machinery as recorded during the trial trip results of three ships, and for battleship Utah I have estimated the auxiliary from the turbine steam pressures, as the water consumptions of the main engines and auxiliaries were not separately measured.

Water Consumption Trials.

Auxiliary Machinery Data.—Pounds per Hour.

	4 hours, Full speed.	24 hours, 19 knots.	24 hours, 12 knots.
Delaware	40,557	30,512	23,457
North Dakota...	26,512	43,791	25,240
Florida	67,352	56,382	41,843
Utah (estimated)	62,400	47,400	29,500
Wyoming	.....	.....	*42,200

*Approximate.

The figures given show greatly in favor of Delaware.

I have tabulated the auxiliary steam consumption of the scout cruisers at three different speeds, which shows that the auxiliary steam consumption of a turbine-driven ship, and a reciprocating engine ship are about alike.

Water Consumption Trials.

Auxiliary Machinery Data.—Pounds per Hour.

	10 knots.	20 knots.	Full speed.
Chester	13,752	24,303	40,025
Birmingham ...	11,809	21,162	41,551
Salem	14,601	22,907	46,003

It is rather curious that the auxiliary steam consumption of Delaware and the scout cruisers at full power are about alike, although the Delaware requires 50 per cent more indicated horse power under this condition. I fully believe that the only way to arrive at a true comparison between Delaware and the Parsons turbine-driven ships, is to send them out together for runs at cruising speeds, on conditions similar to scout tests, or preferably burning oil fuel only.

As regards Curve D, this is hypothetical.

The total coal consumption figures actually recorded on the builders' acceptance trials are of interest.

Coal Consumption Trials.

	Knots.	Coal Consumption, tons per 24 hours.
Delaware.	21.56	578
Utah	21.042	468
North Dakota.....	21.64 (3 hrs.)	583.20
Delaware.	19.217	319.20
Utah	19.225	283
North Dakota.....	19.21	292.50
Delaware.	12.24	111.80
Utah	12.018	118.75
North Dakota.....	12.04	106.20

I have plotted a curve (see Plate B) of speed and total coal consumption in lbs. per hour for Delaware and Utah. At 21.0 knots speed for Delaware and the corresponding speed of 20.82 knots for Utah; Delaware burned 1.14 times as much fuel as Utah, but at 12 knots speed for Delaware corresponding to 12.17 knots speed for Utah, the latter burned 1.12 times as much fuel as former.

Another point of interest, the basis of the contracts for the machinery of these ships was different in each case, Delaware, coal measurements, i. e., pounds of coal per I. H. P. of the main engines and engineer's auxiliaries, whilst in Utah, the contract was based on water consumption in lbs. per hour for turbines and all auxiliaries per S. H. P. of the main engines only.

Dealing with the question of breakdowns, I have been under the impression that reciprocating engine ships do go regularly to navy yards for repairs. Newspapers have reported within the last year that Idaho, Mississippi, Nebraska and Connecticut have required the services of a navy yard to make repairs to the propeling machinery.

As regards breakdowns of turbine-driven ships, only two of these causes are applicable to the turbines of Parsons reaction type.

Blade Stripping

Practically all troubles of this nature have occurred in cruising turbines, and my opinion is that they are largely due to making the blade tip clearances too fine. We have aimed for getting maximum economy, when it is just as essential to have naval machinery free from any possible chance of machinery breakdown. Blading troubles with the main turbines are very rare. When they do occur it is usually after opening up the turbines for inspection. The men who do this overhaul work do not realize the absolute necessity for taking proper precautions to see that no foreign materials are left within the casings.

Rotor corrosion simply means a question of personal supervision down in the engine room, and if instructions are faithfully carried out this will not happen. In the turbines of a battleship, rotor corrosion means neglect; for the interior of every rotor can be thoroughly examined by removing manholes on the casings and internal examinations should be made periodically. There have been one or two bad cases of rotor corrosion in the navy, which have been largely due to neglect. On the other hand, there are many turbine-driven ships in the navy which have had absolutely no trouble in this respect.

As regards reliability, take the engines of the scout cruisers, recall the full speed trials of these ships when they were practically new:

Birmingham made 24 knots, but it was found advisable to shut down at the end of 12 hours, and this ship returned to the navy yard for repairs.

Chester, with Parsons turbines, 25.08 knots for 24 hours.

Salem, 24.32 knots for 24 hours.

Dealing with the somewhat vexed

question of comparative machinery weights and engine room spaces, I have extended the author's list and carried the comparison on to the latest battleships now under construction. In each case, I have first of all given the designed figures, or the basis of all calculation. Note that the displacement of each class of ship has steadily increased.

	Delaware.	Utah, Florida.	Arkansas, Wyoming.	Texas, New York.	Oklahoma.
Designed displacement	20,000	21,825	26,000	27,000	27,500
Contract speed, knots	21.00	20.75	20.50	21.00	20.50
Type of engine	Reciprocating	Parsons turbines		Reciprocating	
I. H. P. design	25,000			28,000	24,800
S. H. P. design	23,000	28,000	28,000		
Engine room					
Length, ft.	44	60	60	60	60
Mean width, ft.	50.50	51	52.50	53.50	58
Total area in sq. ft.	2,222	3,060	3,150	3,210	3,480
Shop weights, gross tons.....	654.50	659.01	648.23		

WEIGHTS INCLUDED ABOVE, AS FOLLOWS.

Delaware.

Main engines and lagging
Throttle valves and fittings
Forced lubrication casings on engines, pipes and tanks
Exhaust pipes to condensers
Two condensers, each 11,788 sq. ft. C. S.
All shafting; spring bearings and stern tube bushes
Propellers and nuts
Air and circulating pumps.

Utah and Wyoming.

Turbines and lagging
Turbine regulating valve and pipes, all valves and pipes between turbines
Forced lubrication system
Tanks and coolers
Exhaust bends to condensers
Two condensers, Utah 15,225 sq. ft. C. S. each; Wyoming 14,308 sq. ft. C. S. each
All shafting and spring bearings and stern tube bushes
Propellers and nuts
Air and circulating pumps
Vacuum augmentors for Utah.

As regards the total weight of the engine room fittings of Delaware and Utah, I do not consider they should be compared on an equal basis, as this is unjust to the turbine-driven vessel. I have, however, taken the actual shop weights of Delaware and Utah and confirm the latter from Wyoming, a still larger vessel, on what I consider to be an equal basis, and my figures show that the weights are about equal in the three ships, if anything in favor of turbine machinery. I cannot reconcile the weight given for Utah.

The machinery weights of Oklahoma will be much greater than Delaware, for the reason that there are four condensers, four sets of air pumps, four sets of circulating pumps, and much longer pipe connections, etc.

Again, the machinery spaces in the three scouts are alike, and the following list gives the total machinery weights of these ships, which shows clearly that the advantage lies with Chester.

Total Weight of Machinery Including Water.	Type of engine.	Weight, tons.
Chester	Parsons turbines.	801
Birmingham..	Reciprocating engines.	844
Salem.....	Curtis turbines.	909

As regards the engine room floor areas, it is of interest to note that Delaware is not being repeated.

There is one special feature I want to draw attention to, in connection with a comparison between reciprocating engines and turbines, *i. e., lost water or make up feed water.*

This loss has never been checked on a battleship trial; in a reciprocating engine, it amounts to a very large quantity at the higher speeds.

Coal Consumption Trials.

	Knots.	Coal consumption, tons 24 hours.	Make up feed water, tons per day.
Chester	*10.03	42.06	10.97
Birmingham .	* 9.86	32.14	10.10
Salem	* 9.90	53.85	11.66
Chester	†19.90	162.90	17.51
Birmingham .	†19.83	153.45	26.10
Salem	†20.25	202.03	16.80
Chester	25.08 24 hrs.	429.40	27.00
Birmingham .	24.00 12 hrs.	375.72	120.00 Leak in receiver pipe.
Salem	24.32 24 hrs.	415.15	45.63

*Test 96 hours.
†Test 98 hours.

This list gives the water losses in the scout cruisers on three trials.

At low speeds, slightly in favor of reciprocating.

At one-half and full power the losses in reciprocating engine very great over that of turbine-driven ships.

I would refer you to Janes' "Fighting Ships," 1912 edition, for an article on "Progress of Warship Engineering," which compares two Italian battleships, San Giorgio with reciprocating engines, San Marco Parsons turbines.

As regards the question of maneuvering, there are over 44 shaft turbine-driven battleships and battleship cruisers now being handled successfully and easily. I do not consider the backing tests made during the builder's trials any criterion. In every case we have been very cautious about stopping the engines, and there is no question but that this can be done in very much quicker time with absolute safety to the machinery. The astern turbines are designed to develop 55 per cent of full ahead power with the same quantity of steam.

In the case of the destroyers, on the builder's trials of the vessels finished this year, the backing tests were carried out practically twice as quickly as they were originally, and it was a matter of special comment on the way the boats stopped, when put full speed astern, going 29½ knots ahead. This will apply in similar way to battleships.

As regards the choice between reciprocating engines and turbines for battleships, I do not consider that the navy department has ruled in favor of reciprocating engines, for in the two battleships recently awarded, one is being fitted with reciprocating engines and the other with Curtis turbines.

Another point that should not be overlooked, give the engineers time to know and understand this new machinery. For instance, it is new to practically every man on your latest battleships, Wyoming and Arkansas, and I know none of them have been shipmates with turbines before.

As regards economy at cruising speeds, from all accounts the ships of Atlantic fleet are now cruising at speeds varying from 14 to 16 knots regularly, and under such conditions I feel certain that the turbine ships will compare equally as well, if not better than, the reciprocating engine ships.

Your latest battleships are now being equipped solely for burning oil fuel under the boilers and to my mind the only possible solution in such a case is:

Turbine machinery, this has been proved conclusively in the destroyers.

The question of economy at the low cruising speed of 10 knots will now have to give way to a much more important one, namely economy at the higher speeds. With a four-shaft turbine installation it is possible to get at least 2 knots more out of the vessel, without any undue strain on the machinery. I do not believe such a condition is possible with reciprocating engines. Further, there is only a very remote possibility by which turbine engines of a four-shaft turbine battleship can be put *hors de combat.*

Combination Steam Engines

As regards a combination of reciprocating engines and turbines in battleships, "if" this is again proposed, I would suggest that the turbines be placed on the outboard shafts, which would get over the difficulty the author refers to, regarding the efficiency of the turbine wheels. It may interest you to know that this arrangement of machinery has proved exceptionally economical on larger merchant ships of moderate speed. Some of these ships have three shafts and others have four shafts. I do not, however, consider it suitable for a battleship.

Many improvements have been made in Parsons turbine machinery both in respect to improving economy and also, of just as much importance, less liability to breakdown.

First. Blading is being made more rugged by fitting two binding strips to the longer blades in place of one.

Second. Radial dummies will be fitted in L. P. turbines of battleships, avoiding all adjustments.

Third. Greater attention is being

paid to fitting auxiliary exhaust nozzles where they will give the best results, but I should like to mention that these connections were fitted and used on the Chester.

Further, it should be borne in mind that the Parsons turbines of the four battleships now completed, have machinery installations which were designed in 1908.

Two destroyers fitted with Parsons reaction turbines of the latest design are now being built at the Bath Iron Works and these designs contain many improvements over the earlier type. The machinery arrangement is entirely novel for destroyers, and I feel confident in making the statement that these ships will be the most economical throughout the whole turbine world.

Dealing with the present destroyers, of which there are 20 of practically the same design in commission, I consider the speed results, obtained with these three shaft vessels, remarkable. The machinery was designed to develop 12,000 S. H. P. at a speed of 29.50 knots. Many of them are able to do and are being forced along at speeds varying from 32 to 33 knots, which means that the turbines are developing upwards of 18,000 S. H. P. at a speed of 29.50 knots. In justice of the turbines I think this is a very unsatisfactory state of affairs. It simply means that the life of the whole machinery installation is being shortened. Further, there is always a grave danger of an accident, due to excessive steam pressure. If 33 knots is required, build vessels designed to do this. Builders' trials are an entirely different question, more men are usually on duty at one time and a greater watch can be kept on the turbine bearings.

Further, on a ship in commission, the displacement is usually greater than with a ship on a builder's trial trip. The remedy is simple, and it is a very easy matter to arrange conditions in the engine room so that the engineers on watch cannot get more than 30½ knots out of these ships.

Doing Better Than Delaware

Charles F. Bailey:—I was very much interested in the paper presented by Capt. Dyson, and possibly being an employee of the Newport News Shipbuilding & Dry Dock Co., you may expect me to refer especially to the Delaware. I do refer especially to the Delaware in this particular, that three weeks before the bids for the proposed battleships Texas and New York were opened, we were at the office of the bureau of steam engineering and discussing with Admiral Cone the possibility of his considering a bid for a reciprocating engine propelled battleship. He asked us if we could do as well as we did in the Delaware, and we informed him we could do better, and we are attempting to do that.

It seems to me that the question of the reciprocating engine, and the revival of the use of the reciprocating engine in the navy, with forced lubrication, is significant at this time, in view of the development which has taken place in the Diesel or internal combustion engine. You know these engines are using forced lubrication, and by this means the engineers are able to run them without giving the usual attention to lubrication which is common to reciprocating engines. By the adoption of Diesel engines, or internal combustion engines, in conjunction with other steam propelled engines, it seems that a large economy can be effected at the lower powers. As you are probably aware, many of you, the European powers are now building battleships with engines of the internal combustion type for cruising. The other screws are propelled by turbines. I admit it is probably not practical to install the immense powers to which we are probably going in the battleships and cruisers in reciprocating engine units. Therefore, the turbine engine is best adapted to those, especially if the vessel is an oil-burning engine vessel, it may be noted that the Diesel engine would be fitted, and is being fitted in several vessels in Europe for cruising. One remarkable thing that is apparent in the Diesel engine is that at low power the fuel economy is nearly as good, for horse power, as it is at the higher powers. By this method the cruising radius of the battleships can probably be more than doubled. I am not aware that we have yet made attempts on this side to install this type of engine or propelling machinery in ships of the destroyer type, or cruiser type, or battleship type. Of course, they are being installed in some submarine types, but it is my opinion we shall soon turn our attention to using the internal combustion type of engine, probably in conjunction with turbines, for the large powered ships.

Parsons Turbine Machinery.

Many improvements have been made in Parsons turbine machinery both in respect to improving economy and also of just as much importance, less liability to breakdown.

First.—Blading is being made more rugged by fitting two binding strips to the longer blades in place of one.

Second.—Radial dummies will be fitted in L. P. turbines of battleships avoiding all adjustments.

Third.—Greater attention is being paid to fitting auxiliary exhaust nozzles where they will give the best results, but I should like to mention that these connections were fitted and used on the Chester.

R. C. Monteagle: — This paper, though brief, is an admirably clear presentation of engineering progress in the navy, and in reading it one cannot escape the conclusion arrived at by the bureau of steam engineering, viz.: that of placing reciprocating engines in heavy vessels of comparatively moderate speed.

Increase of Steam Pressure

The supplanting of steam-driven reciprocating engines is not imminent, nor do I believe such will be the case, until every means has been exhausted to increase the efficiency of reciprocating engines, reduce their weight, and the space which they occupy. The various means of increasing such efficiency have not been exhausted, and the direction which I believe to be the most important, in which improvements to reciprocating engines is to be found, has been neglected. I refer to the increase of steam pressures. By increasing steam pressure, we at once have (with correct engine and boiler design) increased economy, reduction of weight, and reduction of space occupied by machinery and fuel. The pressure mentioned, viz.: 225 lbs. gage pressure, is much too low to effect the economies attainable.

Steam pressures have not kept step with progress in other directions. If they had, they would now be approaching 500 lbs. absolute, instead of 280 lbs. absolute.

In 1899 six cruisers were built for the United States navy. These were fitted with Babcock & Wilcox boilers whose pressures were 290 lbs. absolute. That is now 13 years ago. Why has a halt been called on increased pressures? Is it because of difficulty in getting suitable piston packing or suitable metallic packing for the rods? Or is it because boilers in their present form cannot withstand these higher pressures? If so, these objections are trivial, for they can be obviated. Rise in temperature has been regarded by many as an argument against higher steam pressures. But when it is realized that there is only a difference of 56 degrees in temperature between 280 lbs. and 500 lbs. absolute, this objection is seen to be invalid.

Large compound reciprocating engines of the horizontal type, in stationary plants, are using 150 lbs. pressure and 150 degrees superheat with perfect success, equal to a temperature of 511 degrees. The horizontal type of engine, it is needless to say, operates under more severe conditions than any possible design of vertical engine, marine or otherwise. A distinct gain in economy has been made as ratios of expansion have increased, but to proceed further in this direction in marine practice, steam pres-

sures must be increased, as the point of cut off cannot be advanced.

Quadruple-expansion engines or quintable-expansion engines will be relatively as superior in economy to triple-expansion engines as triple-expansion engines were found to be in advance of compound engines. Quadruple-expansion engines of proper design have already demonstrated their great superiority in the matter of economy to triple-expansion engines as is well known. Knowledge in the art of manufacturing high grade materials has advanced steadily, and it has now reached a point where very much higher steam pressures may be carried with safety. There is absolutely no doubt that engines and boilers can be built to withstand any pressure desired up to 500 lbs. absolute. This pressure when compared with Diesel engine practice is low, and Diesel engines undoubtedly are being operated successfully now, insofar as strains on parts are concerned.

Engines and boilers must be entirely redesigned to conform to such pressures and in doing so it will incidentally be found that some of the forms already adopted in boilers have been very far from perfection. With a pressure of 465 lbs. absolute at the engine, a superheat of 40 degrees might be carried on the seven vessels of the navy fitted for 85 degrees superheat referred to.

I claim for relatively higher steam pressures these benefits:

First. Greater economy in steam and therefore in fuel consumption per horse power. With 465 lbs. steam at the engine close to 15 per cent in steam consumption would be realized over present practice.

Second. Decreased size of steam cylinders, steam pipes, feed pipes and boiler plant.

Third. Reduction of weights in engine and boiler rooms.

Fourth. Decrease in space requred for machinery and fuel.

Fifth. Decrease in fuel required for a given radius of action. As the total heat units required to be absorbed by the boilers are less, for quadruple or quintable expansion engines than for triple-expansion engines, the machinery spaces and weights could be reduced accordingly.

McFarland is Aroused

Walter M. McFarland:—I called the attention of one of the speakers to the fact that he has made a broad general assertion which flatly contradicted a statement in the paper, and I thereby gave him an opportunity to correct what I think was an obvious slip on his part. He did not make that correction, so I must make the correction myself. As matter of fact, the paper by Capt. Dyson states distinctly that the gearing on the Neptune has been a decided success. In the proceedings of another society there was a paper descriptive of the whole ship, which paper went into great detail about the gearing, by the chief engineer, Lieut. Smith, in which he said the same thing, that the gearing has been a decided success. I do not want to detract at all from the credit which is due to Sir Charles Parsons for what he has done. I know the Vespasian was actually operating at sea before the Neptune was. I do know that the gearing on the Neptune was developed by Admiral Melville and Mr. Westinghouse, the two great men I had the honor of serving. I do not think that this gearing was put on the Vestasian before Admiral Melville and Mr. Westinghouse started their work and began to complete their experimental work. The experimental tests were made on the biggest scale of anything I have heard of—instead of trying it out on a few hundred horsepower, the test was made using 7,000 H. P., being a full size gearing, the gearing for a full-size ship. As I remember the figures for the Vespasian they were 700. Admiral Melville and Mr. Westinghouse tried 7,000 H. P., and gave it a working trial lasting 40 hours, the gearing being tested most carefully with an accurately standardized dynamometer, in order to determine the economy of gearing, and its efficiency, which was shown to be very high. That would count, of course, very strongly, as we have learned today, because we have heard how well the machinery of the Jupiter has performed in the shops of the General Electric Co., at the Schenectady test, and this gearing performed in the shop test of the Neptune before the machinery is put on board the boat, in the same way that Mr. Curtis has shown you, while the machinery of the Nevada has also performed equally well in the estimates and design. That is to say, in the actual dock test.

The Neptune has been in service two years, and has had some quite heavy weather. The chief engineer of the ship says the gearing has worked successfully, so that I am surprised to hear a gentleman say that the only successful application of this gearing has been made by Sir Charles Parsons. I felt that I could not refrain from putting this on the record, out of respect for those two great men, Mr. Westinghouse and Admiral Melville, whom it was my pleasure to serve for many years.

The Neptune's Gearing.

I called the attention of one of the speakers to the fact that he has made a broad general assertion which flatly contradicted a statement in the paper, and I thereby gave him an opportunity to correct what I think was an obvious slip on his part. He did not make that correction, so I must make the correction myself. As a matter of fact, the paper by Captain Dyson states distinctly that the gearing on the Neptune has been a decided success. I do not want to detract at all from the credit which is due to Sir Charles Parsons for what he has done.

Ernest H. B. Anderson:—I think Mr. McFarland is quite right. The gearing of the Neptune has worked exceptionally well, just the same as this paper says, at the same time, has the whole of the machinery installation worked well?

Walter M. McFarland:—I understand it works satisfactorily—not with economy—

Ernest H. B. Anderson:—That is the whole point—

Walter M. McFarland:—Let me finish—you asked me a question. Let me answer it, and do not stop me before I get through:—You want to know if it has worked satisfactorily. I understand it has, but not with the degree of economy that was expected by Mr. Westinghouse. They will put other turbines in that will give the full economy.

Richard H. Robinson:—One of the speakers who favored the turbine used the argument for it that a greater speed can be secured. As I understand the paper of Capt. Dyson, it is not indicated that the navy department makes any advocacy of reciprocating engines, as distinguished from turbines, except possibly in a ship such as a battleship, which is comparatively a slow-speed ship. This last summer I studied a good deal on the subject of high speed cruisers, and what they were for, as distinguished from battleships, and what they were for. As I understand the matter, a battleship operates in a squadron with other battleships, and if it should happen that two or three battleships in a squadron have a couple of knots of extra speed, they cannot use this to any advantage, as they cannot go off by themselves. In the case of the destroyers, however, they do go on and operate by themselves, and for that reason extra speed is an important element. I would like to ask Mr. Anderson about the subject of weights.

Subject of Weights

Ernest H. B. Anderson:—In regard to the question of weights, I would say that the different weights for these battleships, are as follows: Displacement—Delaware, 20,000; Utah, 21,825; Wyoming, 26,000.

The weights for the following items in the case of these battleships, are as follows:

Delaware main engines and lagging, throttle valves and fittings, forced lubrications on engines, pipes and tanks, exhaust pipes to condensers, 2

condensers each 11,788 sq. ft. C. S., all shafting, spring bearings and stern tube bushes, propellers and nuts, air and circulating pumps, 654.50 tons. In the case of the Utah and Wyoming, they are as follows: Turbines and lagging, turbine regulating valves and pipes, all valves and pipes between turbines, forced lubrication system, tanks and coolers, exhaust bends to condensers, 2 condensers, Utah 15,-225 sq. ft. C. S. each and Wyoming 14,000 sq. ft. C. S. each, all shafting and spring bearings and stern tube bushes, propellers and nuts, air and circulating pumps and vacuum augmenters for Utah, in the case of Utah 659.01 tons and in the case of Wyoming 648.23 tons.

In the paper the engine-room weight, net tons are given as follows: Delaware, 773.26, North Dakota, 785.-93, Utah, 919.80. That, of course, includes the fittings for the engines, the ice machines, in fact the whole thing.

R. H. Robinson:—I am unable to produce the exact figures, but I am in the fortunate or unfortunate position of having to float this stuff. I know that in every single case when we get a weight for reciprocating engines and a weight for turbine engines, there is a difference. Similarly, it is often the case that I have to make assorted insides for these ships, one to take reciprocating machinery and one to take turbine machinery, and I am very much convinced, from the information we have, that they do not go into the same space, as a matter of practical policy.

But, coming back to the subject of the increased horse power that may be up your sleeve with the turbine-driven ship, my own opinion is, if it is there, as it appears to be, the proper thing to do would be to squeeze down this machinery that you use on the ship, so as to give you the horse power that is necessary to give the speed you want, and make the ship smaller, or else put the difference to the credit of the consumption of fuel.

Ernest H. B. Anderson:—These are the engine room spaces for the five classes of ships, the Delaware, Utah, Wyoming, Texas and Oklahoma. Delaware, total area in sq. ft., 2,222; Utah, 3,060; Wyoming, 3,150; Texas, 3,210; Oklahoma, 3,480.

You will see from this list that the engine room spaces have steadily grown, and that the Delaware has not been repeated.

Limitations of the Turbine

Luther D. Lovekin:—There has been a good deal of talk about turbines and about reciprocating engines, and also some talk about reciprocating engines used for cruising purposes. A couple of years ago I made an investigation into the work of the late Dr. Thurston, wherein he prophesied that by this time we would be using steam, as Mr. Monteagle suggested, with 500 lbs. pressure. I tried to see what we could get out of it. I found limitations existed with the turbine. We know it is impossible to design a turbine and utilize the steam pressure that we can design the reciprocating engines for, so it seems to me, as I said at that time, that we have about reached the limit of pressures in the neighborhood of 300 lbs., with turbines, and it looks as though we must come to a standstill unless we adopt an entirely different proposition, and that is to use the reciprocating engine for 500 lbs. pressure and then exhaust the terminal pressure at 300 lbs. and utilize that through the turbine.

We all know that the reciprocating engine is a pressure engine, and is about the only engine you can use and get high efficiency with high pressure. The turbine is an ideal low pressure engine. I would not hesitate to suggest a reciprocating engine using 400 lbs. pressure and exhausting in turbines using 200 lbs. pressure, and we might show a water rate of about 9 lbs. While I do not know that there is anything novel about that suggestion, I am not advised it has ever been dwelt on before. We must come to that condition if we want to save coal.

Variety of Naval Work.

I notice in Mr. Curtis's remarks that we are not advancing, we are not trying out enough of these things, and I would like to state that within the last two or three years the navy department has had on its hands quite a basket of tricks. We have put in a large power installation of geared turbines, have put into a collier an electric drive, we have put into some of our destroyers a reciprocating engine-turbine combination, and we have considered almost everything else that was brought to our attention. I do not see how we can consider new things more than we have—what we have done almost covers the field.

W. H. Howell:—What pressures are used on the forced lubrication spoken of in the paper?

Hutchison I. Cone:—About 15 lbs. Mr. Curtis mentioned the comparison of the North Dakota and the Delaware as being rather unfair. He is right about that. It is. I mean to say by that that the North Dakota is of a design we know can be improved upon at the present time, and I know that Capt. Dyson did not mean to take exception to the Curtis design, based on that ground. The increase in efficiency of the Nevada, which Mr. Curtis called the new North Dakota, at full speed, on paper is very gratifying, but we did not receive any proposition to reduce the boiler power when the ship was being laid down. Of course, that practically is the answer to the question.

The new cruisers like the North Dakota, are designed better for full speed, appreciably better, but not quite so good at the low power. Mr. Curtis takes us to task quite severely for not adopting a geared turbine auxiliary rig for cruising conditions, and while I think it has great promise, putting it into a plant costing $12,000,000 to start out with, before it has been tried in service, is not good engineering. We will try it on something not quite so expensive.

Program of Navy Department

I notice in Mr. Curtis's remarks that we are not advancing, we are not trying out enough of these things, and I would like to state that within the last two or three years the navy department has had on its hands quite a basket of tricks. We have put in a large power installation of geared turbines, have put into a collier an electric drive, we have put into some of our destroyers a reciprocating engine-turbine combination, and we have considered almost everything else that was brought to our attention. I do not see how we can consider new things more than we have—what we have done almost covers the field.

To get down to Mr. Anderson's discussion, he makes a number of rather positive statements of facts, they are really questions of fact. He states that the turbine ship is not any more inefficient in a seaway, that the efficiency is not cut down by the seaway, while, on the other hand, we have a large number of reports from the fleet, made by the captains, navigators, executive officers and chief engineers of the ships, which point to the contrary. It is possible that they may have a little better data on this point than Mr. Anderson has.

Mr. Anderson states that the Idaho, Mississippi, and Connecticut are frequently at the yard for repairs. They are. We have had quite a number of accidents recently in our shafting, and I will take the trouble to explain to you gentlemen as American citizens, as well as naval architects, that the troubles we have are because of that. As distinctly stated in the paper, the ship with forced lubrication is free from trouble, it is true, Mr. Anderson to the contrary, notwithstanding, because I have better data on that than Mr. Anderson has. Mr. Anderson mentions ships that are mostly old—the Idaho and Mississippi are ships that were laid down as 17-knot ships, and put in the fleet and required to steam with 19-knot ships, which we found was not successful from the shafting standpoint. My opinion is that the firemen are now able to get out of the boilers more power than the designers allowed for, taking data available at the time they were laid down, and simply put in too much

power for the engines. These ships will overcome the shaft troubles.

As to the question of corrosion. Of course, it is hard for me to answer the broad statement that the corrosion is due to neglect. It is. Any corrosion is probably due to neglect but if you have a machine in the ship which you must turn over every 15 minutes to keep it from corroding it is a question of degree of neglect. If it is such a simple matter as Mr. Anderson would lead us to believe, I would like him to inform me how to overcome it. It is a serious thing, some ships corrode and others do not

Now, as to the weight of machinery. I would like to ask Mr. Anderson where he got that from, whence did the weights come? The weights that Capt. Dyson gave to you are positive, they are the absolute weights. We weighed the parts with a scale, and I think some of the representatives of the builders here will agree with me, that they obtained quite a price for that excess weight. If it had been the other way around, we would have heard from them, but as it is, we spent a good many thousand dollars in arriving at these weights.

Ernest H. B. Anderson:—The extra weights in the Utah over the other ships must include a large amount for magazine cooling such as additional ice machines, with all their consequent pipings and fittings.

Hutchison I. Cone:—The two additional lighting machines we have done away with.

Ernest H. B. Anderson:—It is the biggest surprise to us to read Capt. Dyson's paper and find that difference in the weight. We cannot explain it.

Hutchison I. Cone:—The difference in the size of piping made necessary by the different pipes, would not that make up this great difference?

Ernest H. B. Anderson:—The items already given in my paper under the heading of Delaware and Utah and Wyoming show what entered into the list. This list shows the amount of make-up feed water used in tons per day on the coal consumption trial of the scout cruisers at three different speeds. At 10 knots it was slightly in favor of the reciprocating engines, and at half power the reciprocating engine losses were about 50 per cent greater than with the turbine ships.

Gland Leaking

Hutchison I. Cone:—I cannot understand why the loss of water should be greater, to make up for the feed water, with the reciprocating engine, than with the turbine, for my observation with the turbine, and I have observed them a great deal on board ships, is that there is more leakage from turbine glands than from the reciprocating engine, considerable more. It is one of the problems that we would like the turbine people to solve, that gland leaking.

Mr. Anderson is correct in his statement, in his interpretation, that the navy department has not ruled in favor of reciprocating engines at all. We have taken in each case and put in what we think is the best instrument at hand at the time to meet the conditions. The question of cruising at 14 knots and approaching a speed more favorable to the turbine is one that we designers in the department cannot consider, as we are called on for definite cruising speed by the strategists of the department, and we are called on to give a certain cruising speed, and the cruising radius of our ships at the present time is ten knots.

In regard to the turbines, Mr. Anderson misunderstood the meaning of Capt. Dyson's paper, as I interpret it. I think there is no contention in this paper, as Mr. Robinson stated very clearly, for ships of high speed or large power, in favor of the reciprocating type of engine, and I am quite sure, from my dealings with Capt. Dyson, that he did not mean that at all, that the scouts are much more reliable at full speed, and that the reciprocating scout is considerably more economical at low speed, and as to the times that the ships have been in the navy yard, it is undoubtedly a fact that the turbine ships have been at the yard many more times than the scouts, but that is neither here nor there, and should not operate against the turbine, as we must remember that these are the first two turbine vessels to be built, and we have since improved on the design and management.

Lighting of Panama Canal

The Canal Will Be Lighted Throughout By Automatic Unattended Lights

THE Marine Lighting Equipment of the Panama Canal," by James Pattison, was the fourth paper presented, the character of the lighting being briefly summarized as follows:

"In accordance with the plans of the eminent army engineers who are carrying the work to completion, the Panama canal will be lighted throughout by automatic unattended lights, each having a distinctive characteristic. At the entrances and through Gatun lake a double row of about sixty automatic acetylene lighted buoys will mark the channel. The channel will be further defined by powerful, rapid-flashing range-lights, one set at either end of each successive tangent, thus permitting vessels going in either direction to take their range over the bow. The center lines of each range are set apart sufficiently to enable the largest vessels to pass one another in safety. Through the Culebra cut, or wherever the proximity of the banks permits, beacons will be used instead of buoys."

Jacob W. Miller: I have listened with a great deal of interest and pleasure to the able paper which has been presented by Mr. Pattison, and as I am more or less interested in the lighting of buoys and ship channels, I would like to ask him some questions, and get some light on two or three points.

He says on the first page of his paper: "It is generally conceded by lighthouse authorities that the lighted buoy is the greatest aid to navigation produced during recent years. It is inexpensive both in first cost and maintenance, and produces a highly efficient light of from six to fifteen miles visibility, which will burn without attention and with absolute reliability for long periods, even up to a year or more if desired."

I would like to take issue with him on that subject of the expense of lighting the buoy now in use by the Lighthouse Department—the lighting of the acetylene buoys used by that department at this time is very expensive, and the buoys cost from $2,000 to $4,000 each. The matter I have quoted, that one of the advantages of the buoys is that they could be seen from six to 15 miles, in my opinion that would be a disadvantage in the case of lighting a waterway like a canal. In my judgment the lighting of a canal should be in the nature of a series of stepping stones, so that the passage of the ship may be safe from one light to another, and if the rays of the light should go beyond each other, then, in that event, you get illumination which is blinding to the eyes of the captains in charge of the vessels, and interferes with the navigation of narrow channels. It seems to me that the

lighting of such a channel as the Panama canal could be very much better effected by electric lighting, with low-powered lights, as in the case of the Kiel canal, the Manchester canal and the Northeast canal.

I understand that in the narrower portions of the Panama canal such lighting as acetylene will not be used, but some such system as I have spoken of will be used. I hope there are some gentlemen here who are connected with the electric manufacturing corporations in this country, the General Electric Co., or the Westinghouse Electric & Mfg. Co., who can give us some information concerning the electric lighting of narrow channels.

James Pattison:—The same system of lighting is used on the Ambrose channel, the same kind of high candlepower buoys. As far as the buoys used in the Panama canal are concerned, the majority of them would be used through the Gatun lake, as I stated in my paper. The Gatun lake is quite a large body of water, and through the Culebra cut electric lights will be used. That is the plan of the army engineers. In a few of the locks and in narrow portions of the canal, electric lights will be used, just the same as in the case of the street lights. On the lake and at the end of the canal the system as is used all through the United States will be used, that is, high candlepower lighted buoys, placed half a mile apart, or a quarter of a mile apart, the same as on the Ambrose channel.

Life Saving Appliances

This Paper Was Largely Prompted by the Appalling Titanic Disaster

THE fifth paper read was W. D. Forbes' "Notes on Life-Saving Appliances", prompted largely by the Titanic disaster and dealing with lifeboats rather than with any other form of equipment. It was most extensively discussed.

Warren T. Berry:—Mr. Forbes refers to the building of lifeboats with steel. This is evidently a step in the right direction. The first officer of one of the large Atlantic ships told me recently of having completely destroyed two lifeboats in a boat drill by lowering them loaded to their full capacity, and suddenly checking the falls. There is evidently considerable room for improvement in the construction of the boat itself, and I think a steel keel is a step in the right direction.

Mr. Forbes refers to what he calls the hencoop system of life-saving, *i. e.*, a section of deckhouse so fitted that it can be released and floated off as the ship sinks. Of what value would this arrangement be in case of a fire serious enough to necessitate abandoning the ship? Should the round bar davit be damned by the faint praise that it has the advantage of simplicity only?

When fitted with the proper worm and gear attachment, it is adjustable as to outerage, as then it can be held either forward or aft of its extreme outboard position and so keep the lifeboat close alongside for loading or unloading if desired. I have seen at boat drills many times a 26-ft. lifeboat swung out, ready to lower, in less than two minutes with such an arrangement.

The figures given comparing the effort required to operate pin type and quadrant type davits are not at all conclusive, possibly because the pin type davit selected for comparison is not the best design possible. This also applies to the data given of time required to swing out boats with the pin type davits.

Not Conclusive

I have seen many times at boat drill a 26-ft. lifeboat put overboard with a rig of this sort in considerably less than two minutes. The figures given, comparing the effort required to operate the pin type and quadrant type davits are not at all conclusive. It possibly may be because the pin type davit selected for comparison is not the best design possible. This also applies to the data given of time required to swing out boats with the pin type davits.

I have recently witnessed a test of a pin type davit loaded with 2,500 lbs. deadweight, equalling a total load of 5,000 lbs. on the two davits, which is slightly more than the load on the quadrant type davits on the Kilpatrick test. No difficulty was experienced in swinging this load from the extreme inboard to the extreme outboard position in 50 seconds with two men. This davit was listed inboard 6 degrees, corresponding with the Kilpatrick list.

Harold F. Norton:—The paper just read has presented some very interesting information concerning life-saving appliances and has discussed various forms of boat davits, among others one or two unsatisfactory forms of what is termed in the paper the "fixed pin" type of mechanically operated davit. I should like to mention a satisfactory davit of this type, the sheath screw davit. It consists of a davit arm of structural steel channel or I-beam shape, pivoted at the bottom by means of a pin bearing in a steel casting secured to the davit arm by means of triangular brackets running well up the davit arm. The davit is rigged in and out by means of a screw working in a nut formed in the end of a steel pipe, the pipe being pin-jointed to the davit arm just above the ends of the supporting brackets, and the screw shaft being thrust journaled in a pivot bearing secured to the deck frame at the proper height to take a hand crank for turning the screw. When the davit is in stowage position, the screw is housed within the pipe sheath. The deck frame is made up of structural steel angles and channels, all so disposed as most advantageously to take the stresses which come upon them.

These davits have already been fitted on eight or ten ships and by several of the principal yards, the Newport News Ship Building & Dry Dock Co., Maryland Steel Co., the New York Ship Building Co., and the Quintard Iron Works, a number of sets are being manufactured by the latter company for boats of the Fall River Line. These sets are particularly interesting in that they are fitted with a winch for lowering and hoisting the boat.

By the courtesy of the Quintard Iron Works Co., a plan of the arrangement is attached, and it is certainly a neat and compact arrangement of mechanically operated boat davit and winch.

Fixed Pin Type

The fixed pin type davit shown in Plate 1 of the paper has a pin which is obviously too short and not properly supported in the fore and aft direction from the deck, nor is the support carried far enough up the davit arm, but the sheath screw davit provides against all these objections by the long and substantial pin, with brackets extending well up the davit arm, and properly arranged deck connections. It is, of course, perfectly easy to design a pin connection entirely capable of accepting all of the stress transmitted to it from the davit arm, or which the deck connections are capable of accepting.

Another point commented upon is the liability of the screw-operated davit to injury of the screw by the fore and aft swing of the boat. This point has never been taken very seriously for the reason that in the sheath screw davit the boat can never strike the screw but only the pipe sheath, and then only for a short part of the motion at the beginning when the boat is rising from the chocks, and when both sheath and screw are in positions to be least affected. Also the fore and aft swing of the boat is by no means so violent as might at first appear, which will occur to each member of the Society when he thinks of the necessarily slow longitudinal period of oscillation of a ship of any size, and then applies this to a pendulum of the length of the

davit falls with the boat suspended above the deck, and acting within the comparatively limited space between the end of the boat and the davit itself. The quadrant davit illustrated in the paper appears to have no particular advantage in this respect, since in its case the boat will strike against the cast steel quadrant or the davit arm itself, and be transmitted directly to the screw and guide shaft. The blow may also occur when the guide sleeve is in the middle between the ends of the screw and guide shaft, a position in which they are least capable of sustaining it without injury. However, both constructions are so substantial that there is really no serious danger of injury from any blow likely to be received in this way.

Quadrant and Fixed Pin Type

The next point discussed is the comparative effort on the crank for the quadrant and fixed pin types. It is a fairly simple proposition to figure static forces on an apparatus of this kind if the forces are in one plane, but when it comes to figuring frictional forces and making proper assumptions for coefficients of friction, the problem is much more difficult, and the expressions given in the paper appear quite too simple to be true. They are not probably true of the turning effort required on the crank of a sheath screw davit, for all the sets installed have been tested and found satisfactory, the empty boat or equivalent weight being readily rigged out with one man on each crank, in a little over one minute's time. It is quite true that the quadrant type davit is somewhat easier to start outboard than the fixed pin type, on account of the more nearly downward direction of the boat from the start, but this is accomplished at the sacrifice of the feature that the boat shall be naturally lifted from and over the chocks, and make some special form of tumbling chocks always necessary with the quadrant type. This type of davit ought theoretically almost to roll out of itself, if the ship is on an even keel, but the fact that some effort is required on the crank all of the way is due to the introduction of numerous forces and frictional resistances, many of which are not mentioned in the paper or included in the formula. The forces are not in one plane, but on the contrary, have several different planes and lines of action. By examining the construction of the quadrant davit illustrated in the paper, it will be noted that the davit arm is carried on an overhung pin cast in one piece with the sleeve embracing the guide shaft and the screw, the center line of the pin being about on the same level as the center line of the guide shafts and the center line of the screw being some inches below and about vertical under the guide shaft. The pressure of the davit arm on the pin therefore exerts a considerable moment on the guide sleeve in one direction, which in turn being transmitted to the screw produces a considerable moment in another direction. None of the forces are in line with each other, and even the pressure transmitted by the davit to the pin is not a simple pressure, as there is quite a twisting moment introduced by the fore and aft overhang of the davit. All these forces must produce considerable frictional resistance, not to mention the friction of the rough, rolling surface and the gear teeth where the quadrant meshes with the rack on the deck.

The forces on the screw-operated pin davit are somewhat simpler, being more nearly in line, but even in this case, figures are practically worthless, and seem useless in the face of an actual trial with the loaded boat or an equivalent weight. The paper estimates that the quadrant type is also slightly easier to rig in, but it is very doubtful whether this will be found to be the case in practice, and probably that on account of the various frictional resistances mentioned above, the quadrant type will be found considerably harder to rig in than a properly designed screw-operated fixed pin type.

It was not explained in the paper we have just heard, that the pin type davit mentioned on page 10 as being tested with very unsatisfactory results, is an entirely unusual arrangement, wherein both davits are operated together through the mediation of a steel shaft connecting the two, this shaft being revolved by means of a worm quadrant, worm and spur gears, ending in a hand crank operating the entire arrangement. This apparatus resembles a quadrant davit about as much as it does the usual pin type, as previously discussed in the paper, and it is very misleading to mention this as "the very interesting, practical and convincing test, which showed the disadvantage of the pin type davit," without explaining more in detail exactly what kind of a pin type davit it was.

But, of course, this feature probably did not occur to the author of the paper, as he doubtless intended no misrepresentation. The performance of the quadrant davit mentioned on the same page is about the same as should be expected of a well designed screw-operated davit of the fixed pin type, and is about what has been accomplished with the sheath screw davit.

The principal advantage of the sheath screw davit, other than that it is simple and inexpensive and composed largely of structural shapes, so that it may be built at any shipyard or readily repaired in case of injury due to collision or other accident, is that in stowage position the screw is completely housed and protected by the sheath. The end of the sheath is closed by a watertight, removable cap and the sheath may be filled with grease for lubricating the screw.

In the quadrant type, illustrated in the paper the screw and guide shaft are exposed to the weather, protected only by a flat cover strap an inch or so above the guide shaft, and although they are both of brass, it would seem that the action of air and seawater must considerably increase the friction unless they are kept carefully cleaned and frequently greased. It also seems that a careless man might put a coat of paint on the guide shaft, the average painter being liable to consider it as proper a thing to paint as the cover strap just above it. The quadrant rolling in the groove with its gear teeth meshing with those in the deck rack, seem also to give such good opportunity for the accidental presence of foreign substances to make trouble, that it is remarkable trouble does not more often occur. Undue roughness or irregularity of either quadrant or deck casting will produce wedging action between the deck casting and guide shaft, or else throw all the weight of both boat and davit on the guide shaft. However, the large number of quadrant davits in successful operation shows that these conditions adjust themselves through the spring of the material, or in some such way, but it appears possible that they may make one davit of this type less easy to operate than another, and the same davit more or less easy to operate at different times, depending upon the kind of care it has had.

Sheath Screw Davit

The sheath screw davit is an attempt at still further simplicity, and foolproofness by further obviating the necessity for care, but there is still something to be desired, as the pivoted thrust bearing on the deck frame is now exposed to the weather. A further development in this davit which is now being attempted is the production of a satisfactory oil and watertight ball thrust bearing, so that this bearing may be kept full of oil and at all times protected and lubricated just as the screw is protected and lubricated by the sheath.

J. Howland Gardner:—I have listened with considerable interest to Mr. Forbes' notes on life-saving appliances. It would appear from this paper that the writer's experience has been limited mostly to experiments with the Welin type davit, which is well designed and very efficient, and a few other types of davits of inferior design. I say inferior design, because there are davits of the various types mentioned that fulfill all

Various Types of Davits.

It would appear from this paper that the writer's experience has been limited mostly to experiments with the Welin type davit, which is well designed and very efficient, and a few other types of davits of inferior design. I say inferior design, because there are davits of the various types mentioned that fulfill all of the requirements laid down in this paper. Among others might be mentioned the Norton davit. Mr. Warren T. Berry has made some interesting experiments with this type of davit and I am sure will be glad to give us the results of his experiments.

of the requirements laid down in this paper. Among others might be mentioned the Norton davit. Mr. Warren T. Berry has made some interesting experiments with this type of davit and I am sure that he has a memorandum in his pocket and will be glad to give us the results of his experiments.

Round Bar Davit

There is another type of davit touched on in this paper—*viz.*, the round bar davit, that is turned by a worm and wheel. This device is passed over as being of some assistance, but has but one reach or overhang. This is not correct, as with this type of gear a lifeboat can be placed anywhere within the range of outreach of the davit from a point where the gunwale of the lifeboat is flush with the side of the ship in the extreme throw of the davit.

The particular boat handling device referred to is the Irvine handling gear. The rapidity with which a lifeboat can be handled with this gear was illustrated in a recent collision between our steamer Commonwealth and the Norwegian tramp steamer Volund. This collision happened about one o'clock in the morning, on Sept. 26, 1908. Immediately after the collision a boat crew from the Commonwealth was called, a lifeboat launched, and the entire crew of the Volund, consisting of 14 men, were rescued by the Commonwealth boat before the Volund sunk, and when it is considered that the Volund sunk six minutes after the accident, there can be no doubt of the efficiency of the lifeboat handling gear.

I happened to be on board the Commonwealth the night of this collision, and to my mind far more important than gear for handling lifeboats or even the lifeboat itself, is to have vessels so designed that it will be well nigh impossible for them to founder.

Next to the design of the ship is the necessity for a trained crew. With a trained crew, there are many types of boat handling gear that are efficient, and without a trained crew, the best and most elaborate boat handling gear will be inefficient.

There is another matter Mr. Forbes drew attention to, the time required to swing the old type davits out from the boat, and I want to say that the United States law requires a ship to be equipped with boat handling gear so that the boats can be launched inside of two minutes, and this must be done by some type of gearing used on the ship, and even includes the davit that is swung by hand.

A. P. Lundin: — I am surprised, first, to find that a discussion on lifeboats and davits has started in so lively. I thought there would be nothing short of a turbine that could create so much interest as has been shown in this discussion up to this point, and second, I am surprised that there seem to be so many members who are in the davit business.

Now, if we read Mr. Forbes' paper as a whole, it covers both lifeboats and davits, and I think that is the only way to cover it properly. This idea of building a lifeboat like an Indian builds his canoe, or used to build his canoe, which has been more or less the practice in the past, and this idea of having any sort of a davit that might be most convenient, or that might be the cheapest, is not the proper idea, I think, from an engineering point of view.

At the same time I do not agree always with the engineers in this respect. I think this question of carrying sufficient lifeboats and being able to efficiently launch them when you need the boats, is a matter that should be worked out in co-operation with the sailors, with the old salts. I was wishing, a little while ago, that I had some of you people, who are here today, with me at certain times in my past experience when we actually had to do some work with lifeboats. There are certain physical conditions that arise on board a ship. For instance, if you are hanging with your eyebrows onto a yard arm, and the arm is whipping around so that your point of suspension is describing an arc of 100 degrees, or say you are down in the fire room and the bilge pumps are out of order, and the bilge water washes over the place, creating the most hideous odor, that would overcome the strongest nerve; for instance, when you get alongside of a big ship, when a heavy sea is running, with a load of passengers which you have rescued from a wrecked ship, and when the sea is running so high that you think one minute your boat will land on the deck of the ship, and the next minute under the bilge; under those conditions I have found that engineering principles, and a knowledge of ship design, count for less than a strong stomach and a firm hand. That is one of the reasons I believe that this problem of lifeboats and davits should be worked out in co-operation between the engineers and sailors. If we take the problem as a whole, I do not think you will get a satisfactory system, unless you consider the boats and the davits in their relation to each other. When you design your ships, of course, you have to make arrangements to carry so many lifeboats, to give a sufficient capacity of lifeboats for the rescue of the passengers on the ship in case of need. Then comes the time to decide this as a whole.

Lessons From the Titanic.

I believe that the important lessons of the Titanic disaster are:

First, the necessity of eternal vigilance on the part of the navigator as the price of safety. Second, that naval architects and shipbuilders should make merchant ships, particularly passenger steamers, more secure against damage by collision, both in the way of additional strength of construction and additional watertight subdivision. Ships can be made much safer than they are at present, although the day of the practical, indestructible ship has not yet arrived. Lastly, provide sufficient lifeboat accommodation for everybody.

As regards Mr. Forbes' paper, where he speaks of the advisability of having the lowering controls in the boats, I cannot agree with him. I believe that, for one thing, it would encumber the boats too much and be difficult to keep in order. I believe that if Mr. Forbes had been in a lifeboat, like I have been once or twice, coming alongside of a ship in rough water, he would be more than glad to leave the hoisting end of it to those on deck, who stand on a firmer footing—that I am quite convinced of.

I agree with him that for ships of ordinary height that lowering controls are as good as anything else for lowering the boats, but if it comes to very large ships, where the boats are placed from 60 to 80 ft. above the waterline, it is a different matter, and I believe then, in that case, the system that Mr. Axel Welin, of London, has worked out for the Imperator of the Hamburg-American line will solve the problem. There are other times when you may not be able to hoist the boat, that is, if you stretch the problem far enough to provide for the rescuing ship. There are times when any common-sense sailor would consider it foolhardy to attempt to pick up the boat in the davits and hoist the whole load up. But then there are other ways out of it. You can, for instance, rig out one of your cargo cranes, if you have it, and provide it with a special basket like that which is used in the steamers in the Norwegian islands. They transfer most of their passengers, and embark and disembark them, in small boats, and the way they get on board in rough weather is by means of the use of these baskets. That is also used in ships running to Central America and South America, where in many places the ships have to anchor in the open roadsteads, and that is a system that could be used on ocean-going ships under extreme conditions.

Construction of Lifeboats

As regards the construction of the boats, it is very pleasing to me to know that government officials in this country as well as elsewhere are giving this subject some attention. As I said, it seemed, some time ago, like the average boat builder built the lifeboat like the Indian built his canoe. There should be some system of some kind about the construction of these boats, and that the question of building an efficient lifeboat is of sufficient importance to warrant that naval architects and marine engineers should give it some attention, and also the government, and the more stringent the rules and regulations governing the construction of lifeboats becomes, the better it will be for the ship operators, and in the end for the public at large.

There has been something said con-

cerning the efficiency of the pin davit. Mr. Forbes' paper looks to me somewhat mixed up—it is all pin davits, as far as I can understand it, although some are movable pin davits and some are stationary pin davits. It is a new term, which has come to the quadrant davit. I am not beating around the bush. You all know I am selling the quadrant davit. I will tell you why. I started in this business because I had some experience with lifeboat davits, and I found that the davits were not efficient, and before taking up any specific davit, I engaged some attorneys to furnish me with all of the U. S. patents on all kinds of davits, and also copies of all specifications on applications for patents, which were issued from time to time, and they kept on sending these to me until they ran up to over 2,000, and I had to ask them to stop. I glanced through some of the most interesting of these patents, and then I sifted it down to those that had actually been tried out, and I found that there were about 200 that had actually been tried out on board ships. I do not say that the davit has been tried out when you put it on a dock and experiment with it, or even on a ship and test it in the harbor. In my opinion, it has not been tried out until it has actually been used at sea, and some of these davits have been in use as long as three years. I still believe that the Welin davit is the best davit in the market today. I do not think it is the cheapest, but it is certainly the best.

Too Much Top Weight

Mason S. Chase: — I have been much interested in what Mr. Forbes has said about the desirability of having the best possible equipment of reliable lifeboats in sufficient number, also the necessity of having the davit or other launching apparatus for these boats strong, simple and under perfect control. The steel boats of the Lundin type would seem to fulfill the requirements of a strong, seaworthy lifeboat, and one which can be nested in groups of at least two, to economize deck space, and economy of deck space is an important matter. I would like to ask Mr. Forbes what is the weight of these lifeboats, per person accommodated? I have noted from some figures published in connection with the investigation of life-saving appliances by the Board of Trade in England that the weights given for open and decked lifeboats, also liferafts, per person accommodated, ran from 68 lbs. to 72 lbs. and over. The weight of collapsible boats was given as about 40 lbs. per person accommodated. This item of weight of boats and weight of davits and other launching appliances is a very important one.

The stability of many existing ships would be seriously compromised by the addition of as much top weight as sufficient lifeboat accommodation for everybody would necessitate. Of course, this condition can be met by reducing the number of passengers carried to correspond to the lifeboat accommodation which can be provided.

The innovation introduced by a Japanese line of passenger steamers, running across the Pacific, of giving every passenger a ticket to a certain lifeboat seat may give some timid passengers a new feeling of security, but many will have their confidence in the safety of ocean travel much shaken by this innovation. Such a system of tickets for lifeboat seats will certainly give all passengers a new interest in lifeboats.

I believe that the important lessons of the Titanic disaster are:

Eternal Vigilance

First, the necessity of eternal vigilance on the part of the navigator as the price of safety. Second, that naval architects and shipbuilders should make merchant ships, particularly passenger steamers, more secure against damage by collision, both in the way of additional strength of construction and additional watertight subdivision. Ships can be made much safer than they are at present, although the day of the practical, indestructible ship has not yet arrived. Lastly, provide sufficient lifeboat accommodation for everybody, but remember that when an accident to a vessel occurs under severe weather conditions, such as are often met with in the North Atlantic, particularly in winter, that many of the lifeboats provided are likely to have been damaged even before they are launched, and that life in the boats would be so unbearably hard that most people would prefer to go down with the ship rather than to attempt to go into the boats, even if it is not absolutely hopeless to attempt to utilize the boats.

Spencer Miller: — The subject of this paper is, "Notes on Life-Saving Appliances", and yet we have practically heard of nothing but davits and boats. I have given this matter a little attention in the last two months, the matter almost having been forced upon me on account of my knowledge of the use of automatic reels for coaling at sea, and it occurred to me that this system might be available for use in life-saving. The whole question is one of paramount importance. Perhaps you do not realize that there were 562 ships lost in 1911, and a corresponding number in 1910. Five hundred and sixty-two ships a year represents a considerable loss of life on the ocean.

Now, there is another thing that should be thought about, and that is, that the whole matter of life-saving at sea is changed because of the introduction of the wireless telegraph. All passenger ships at sea carry the wireless telegraph, and every such ship is required to respond to calls for help received through the wireless telegraph. Under these circumstances the death toll of the sea is likely to be much reduced.

We must not confuse the ship's lifeboat with a surf lifeboat. The surf lifeboat is manned by a picked crew, men who are masters of seamanship. The work of rescue which they can do is one of the marvels of the day. The common ship's lifeboat has no such crews, it is a question whether it would even be launched, not to say anything about being the means of making a rescue from a wreck, and then bringing those who are rescued back to the assisting ship. The boat goes to the rescue with brave souls and willing hearts, but when they arrive, in nearly one-half the time, they will find themselves unable to render assistance, because they have not the implements. That is just exactly why I am talking. I am coming to that phase of the question under consideration. The report on the loss of the Titanic stated that if the sea had been running rough it would have been very doubtful whether any of the lifeboats would have reached the water at all, or, at any rate, reached it in safety.

Now, I propose to bridge this gap between the rescuing ship and the wreck with the common, well established breeches buoy apparatus, and the rescuing end of it will be fitted with an automatic reel to maintain a uniform tension on the connecting hawser to permit its length to run out. The line is always taut. You cannot snap a taut line. You can snap a line that slacks, but a line that never slackens can never be snapped.

W. D. Forbes:—The idea of this paper was to suggest something about life-saving appliances, and I laid down certain requirements. I do not think any of those who have discussed the paper have disproved my ideas as being incorrect. Capt. Lundin, I think, misunderstands my idea of boat control. It was not my intention that the apparatus should be in the boat itself, but on the deck of the ship, with a connection in the hands of the man in the boat.

No Suitable Variable Outreach

Mr. Berry has found that the hencoop system does not please him very much, and I think it would take a good deal of nerve to stay on the deck of a boat, even if it was ashore, with a platform that was knocked out from under you, and to go ashore on the hoops. The Welin davit is known to me, and it can be used, but that davit has no suitable variable outreach. It has a variable outreach, but it is in the arc of a circle, which makes it awkward to handle.

Mr. Norton's sheath davit is an excellent davit, but I fail to see why we need the sheath in protecting the screw. The force of the boat striking would not bend the sheath and screw, as well, if it was made of the proper strength. The Commonwealth, at the time that the accident occurred to it, was in perfectly calm water, and the crew were able to get the boat down in quick time, but when you are in rough water, you want something besides a davit swinging out with a reel which cannot be easily controlled.

Mr. Miller speaks of taking out the slack of the rope which, of course, is an excellent thing to do, but that might apply to a row boat—I do not see how that hits my case. I can see that in towing a wreck it would be excellent.

Preservation of Metals

Dealing With the Metal of the Hull, Engine, Boilers and Machinery Accessories

THE sixth paper read was Lieut.-Comdr. Frank Lyon's paper on "The Preservation of Metals Used in Marine Construction." The author dealt with two sub-divisions; the metal of the hull, the metal of the engine, boilers and machinery accessories. The causes of the wasting away of such metals are three—corrosion, abrasion and erosion.

Henry Williams: — Commander Lyon has rendered valuable service in bringing before this society the question of the corrosion of metals, also in elucidating the electrolytic theory as to its causes and the conditions under which the electrolysis takes place. I believe, however, that few of those present will be willing to accept his statements in toto, for while there is no question that fundamentally he is correct, differences will be drawn as to the conclusions and the interpretation of the various phenomena.

He treats of a subject that unfortunately has not received much attention from shipbuilders, except in so far as the effects of corrosion have manifested themselves in necessitating repairs.

Largest Item of Expense

Painting, which is the largest item of expense in the up-keep of ships, is required almost entirely by the necessity for preventing or at least checking corrosion. Commander Lyon states the necessity for proper painting, but unfortunately he places himself in the attitude of regarding the price of a paint as an index of its efficacy. He states also his opinion that the best paint is none too good and should be obtained at any cost. I am unable to agree with his view in these particulars. In my opinion, paint should be selected entirely with a view to its fitness for the purpose for which it is to be used, having in mind always the value of service which it is expected will be rendered. Where it is intended to preserve the metal in inaccessible locations, it is obvious that within reasonable limits the cost should not be considered in the effort to obtain the most effective paint. On the other hand, if it is a question of painting for decorative effect the exterior surface of a ship in a location that is easily accessible and that has already a number of coats of paint on it, consideration should be given to the probable time the paint will be expected to last before repainting, and a cheap paint should be applied, if that will meet the requirements. However, I wish to emphaside my idea that the price is no index of quality of paint. I think often a cheap paint, properly compounded, has greater merit than the conventional high grade paints made with linseed oil, turpentine, lead and zinc.

Zinc Protectors

As regards the question of the use of zinc protectors, Commander Lyon appears to have lost sight of the fact that these zincs are put on for the purpose of protecting the steel from the electrolytic action produced by copper alloys used in sea chests and propellers. He states his experiments were by way of proving that the zinc had no effect in reducing the corrosion of steel alone. In order to demonstrate this point clearly, I have had prepared two small bars of steel with smaller bars of copper attached. On one of these couples the copper was surrounded by a frame of zinc. All were submerged in salt water, and the conditions may be regarded as exhibiting in an aggravated form the action that takes place continually between the steel of the ship and the copper in underwater fittings, as well as the protective effect of the zinc. These samples, which I will exhibit, have been submerged only about 72 hours and show in a striking contrast the corrosion of one, and its absence on the other. The zinc sample leaves practically no corrosion at all on the steel. The sample which has a copper lining is badly corroded.

The statements as to lack of advantage of using galvanized steel plating is hardly borne out by the experience in connection with older torpedo craft, some of which had their underwater bodies built of black plating. These have corroded much more rapidly than others where galvanized plating was used.

Another point to which I call attention in connection with the statements in the paper as to the corrosion of salt water piping, is the fact that this difficulty has been solved effectively on United States naval vessels by the use of lead-lined pipe for such purposes. This has eliminated the difficulties referred to.

The Marine Oil Engine

Lecturing before the Institution of Engineers and Ship Builders, at Grimsby, recently, Prof. J. Okill, of the Engineering Laboratories, Liverpool University, gave as the chief reason for the superiority of oil engines over steam for marine propulsion economy in fuel consumption and machinery space. Of the total heat energy in the coal fed into a steam boiler, supplying turbine engines, not more than 14 per cent is given out as useful work to rotate the propeller shaft, while a modern oil engine of the "Diesel" type has an efficiency of conversion from fuel to shaft as high as 32 per cent. Compared with a steam engine and its boiler, the oil engine takes up much less room.

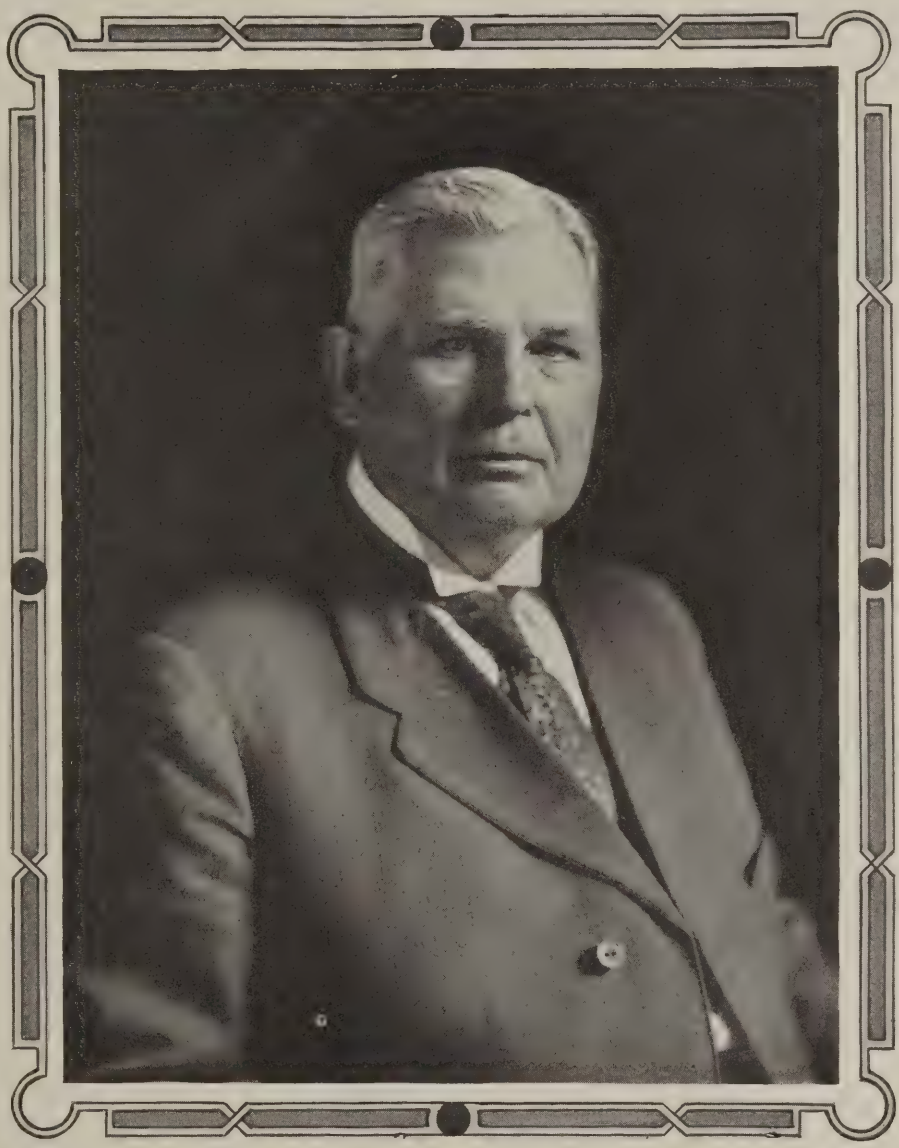
Bunker space is also considerably reduced, the volume of one ton of oil being about 39 cubic feet, while 44 cu. ft. is necessary to store one ton of coal. The greater heat value of oil, compared with coal, bulk for bulk, and its more economical use in the engine, are, however, the chief factors which contribute to the reduction in bunker space. The oil engine requires less auxiliary machinery than the steam engine, while by reason of the fact that the pressure units in an oil engine system comprise in most cases the engine cylinders and a few comparatively small air reservoirs, the advantages from this feature alone are of no small importance when considering the application to marine propulsion.

In recent years oil fuel as a substitute for coal for generating steam in a boiler has made rapid strides, and there is no doubt but that the success of this system of steam raising has to some extent held back progress in marine oil engine development. On the score of economy the oil-fired steam boiler will not bear comparison with an oil engine; oil-fired steam boilers are, however capable of reverting to coal fuel without delay should it become necessary. This may happen through failure of supply, or through an increase in the cost of oil fuel such as to render coal the cheaper to use. If the principal use of oil fuel were for steam raising and as a competitor to coal, then it is conceivable that oil fuel would always be obtainable, so far as supplies permitted, at a price in favor of its use. The success of the whole scheme of oil engine propulsion turns on an adequate supply of fuel.

Tribute to Stevenson Taylor

A Spontaneous Outburst of Regard and Affection for Its Retiring President

ONE of the fine things at the meeting of the Society of Naval Architects and Marine Engineers in New York last month was the spontaneous tribute of affection and regard which was paid to Stevenson Taylor, the retiring president. Mr. Taylor relinquished the chair during the session Friday afternoon to keep an appointment and was about to leave the room when Rear Admiral Washington L. Capps, vice president, detained him by saying that if he felt that he could escape any expression of the society's opinion he was very much mistaken. He then called upon Walter M. McFarland to say what he had in mind.



STEVENSON TAYLOR

"I believe I voice the unanimous sentiment of the society," said Mr. McFarland, "when I say that if it had not been for that clause in our constitution, which forbids a president succeeding himself, Stevenson Taylor would have remained in office indefinitely, or as long as he was willing to serve. We want him to know how greatly we feel our indebtedness to him for the able manner in which he has presided over our deliberations. He is a model presiding officer. He has conducted our affairs with decorum, with the best of taste and excellent diplomacy. His work in the interest of the society from the very start has been of the very highest character. He has been, in fact, one of the cornerstones of the society. But above all, above his ability as a presiding officer, as a marine engineer, comes his magnificent character and his splendid and lovable qualities as a man. Everyone of us who has had the privilege of his friendship for many years has grown to love him more and more as the years have gone by, and I can say for myself that I know of no higher type of American manhood than Stevenson Taylor, president of our society."

Mr. McFarland proposed a vote of thanks to President Taylor for the admirable manner in which he had conducted the affairs of the society during his term of office. The motion was seconded by Richard M. Watt, chief constructor of the United States navy, who said that it was his privelege to be a delegate of the society as well as a representative of the navy department at the International Jubilee Congress, held in London in the summer of 1911.

"Nothing," said he, "could possibly have raised the society to the highest level in the opinion of our British and continental colleagues more than the dignified, able and intelligent manner in which our president represented us."

Rear Admiral Harrison I. Cone, engineer-in-chief of the navy, spoke of the esteem and personal affection in which Mr. Taylor is held by the officials at Washington, and he believed his personal example to be one of the greatest assets of the society.

Jacob W. Miller said that as a steamship owner he had had the good fortune of being associated with Mr. Taylor for twenty-five years and during that time had entered into many contracts involving millions with him. During all that period the honor and integrity of Mr. Taylor and his company were never in question, that there never existed the slightest friction and that upon one occasion a contract involving an expenditure of $2,000,000 was given to Mr. Taylor and its conditions expressed on simply two pages. He considered the personal regard of Stevenson

Taylor as one of the greatest assets of his life.

"I almost regret," said Admiral Capps, "that I asked Mr. Taylor to remain because he has certainly had to listen to things that must make him feel as it has made us feel, a little choky in the voice. To have such a unanimous feeling from a body of men of this kind, which has had at times to be ruled with an iron hand, is truly a tribute of which any man should be proud."

It was with difficulty that Mr. Taylor replied and it was quite clear that he felt a little bit choky.

"I hardly know," said he, "which to do most, to grieve or to rejoice. When you elected me president three years ago, I looked upon that election as the climax of such a career as I might have had. It seemed to me then, and it seems more so to me now than then, to be the highest point of achievement that I could possibly reach. When one reaches the top of the hill one is apt to grieve, and that is why I say I hardly know now whether to grieve or to rejoice, but I am sure you will believe that after all I must rejoice much more than I grieve. That I have warranted any such remarks as have been made has been to me an unthought-of matter. I could not possibly have expected them and I thank you one and all. I thank you from the bottom of my heart."

Electrically-Driven Steamer

Mr. Donnelly's Proposed Fireproof Passenger Steamer Evoked Lively Discussion

THE paper which provoked the widest discussion was W. T. Donnelly's paper on "An Electrically Propelled Fire-Proof Passenger Steamer." The steamer described by Mr. Donnelly was intended to operate in the excursion trade in the sound.

Andrew Fletcher:—I think we all should thank Mr. Donnelly for his progressive thought and the time that he has put on this paper. But this is not, however, an entirely new subject. It has been under thought for some time, and the nearest approach to an electrically propelled vessel of any power is the Jupiter that is not yet running.

Based on Land Practice

It seems to me that Mr. Donnelly, in what he has just stated as to the coal per horsepower per hour, is basing his power entirely on the land practice. When that power is applied to revolve three screws I do not believe it will work out.

Mr. Donnelly has particularly spoken of the excursion class of steamers, and made a slap at the old beam engine, stating that there has not been any advance since 25 years after the Clermont was built, in other words, that the engine was fully developed about 25 years after the Clermont came out. Our concern, going over an experience of 60 years, has probably built more beam engines than any other concern in the United States, and possibly, I might say, almost more than all the other concerns together. So that I feel that in criticizing some of the statements that Mr. Donnelly has made, and desiring to do it in a conservative way, I feel that so much has been said about the old time beam engine by those who only have a superficial knowledge of its worth, that once in a while we have to get back at them.

Mr. Donnelly has made reference to the weight per horsepower. His figures are anywhere from 25 to 35 per cent out. He has spoken of the economy of the beam engine in comparison with his electrically propelled excursion steamer, and there I know he is fully 20 per cent out.

Weight Per Horsepower

He starts off in his paper by making a comparison with the old Grand Republic, one of the very oldest boats in the harbor. He states himself he does not know when the engine was built, but that it was many years before it was put in the Grand Republic in 1878. It is still going along, and I might say only yesterday the owners of the boat asked us to do some work on this old engine. But there he takes a type of an old beam engine, with a piston speed working, as he said, about 400 ft. per minute. He pays absolutely no attention to the modern excursion boat, fitted with a walking beam engine, where the speed is over 600 ft. per minute. We have vessels on the Hudson river with 72 in. diameter cylinders and 12 ft. stroke running from 28 to 29 or 30 revolutions per minute. So that to compare a beam engine, with a 72-in. cylinder, as he has expressed it here, with the Grand Republic, is absurd. He also does not state the advance which has been made in the paddle wheels. He takes the old boat, with the old style, less efficient waterwheel, and makes his comparison. This engine that he speaks of has a wheel 38 ft. in diameter. We would not think of putting in a wheel like that today, and have not for years. For that length and size of engine, if we wanted to run at double the speed we would put in wheels fully 10 or 11 ft. smaller in diameter, with less surface to the wheel, so that when you consider these statements the paper lost some of its effect with me because he has not thoroughly familiarized himself with the facts. I would not have you feel that I think the beam engines are the only engines for these boats, but it has always been our idea, shared by the excursion people, that this engine supplies the requirements.

As I say, I would not have you think that we are purely beam engine men because we produced the first Parsons marine turbine ship built in the United States, the Governor Cobb, and followed it with the Yale and Harvard. We have had cracks at all kinds of engines.

Flimsy Character of Excursion Boats

A reference was made in this paper, I think, as to the more or less flimsy character of the present excursion boats. We will find in the modern excursion boat that really in the past 10 or 15 years there have been many refinements introduced in their construction, for instance, the machinery and boilers are enclosed in steel all the way up. Steel girders are used in lieu of wooden girders and there are practically no wooden stanchions used. When it comes to the state room boats considerable advance has been made in them, and they have tried to fireproof them as much as practicable. We know that the substitute of the composite or the so-called "never split" panels is far safer than the pine panels formerly used. The Fall River line has given a great deal of thought to fire prevention. But the commercial side must be considered and in the vessel which Mr. Donnelly suggests the expense of construction would be so great that I do not know of any excursion company around the harbor of New York or anywhere else who would consider it.

There have been steel superstructures built. A boat was built which ran between Norfolk and Washington which has a superstructure entirely made of steel. I do not think

that boat has never been duplicated. The Pennsylvania Railroad Co. a few years ago also built a steel superstructure ferry boat, which runs from Camden to Philadelphia, which has given very good service, but in that latter case the superstructure is infinitely less than it would be on an excursion steamer.

Loss of Life

He makes reference here also in a general clause to the great loss of life. Of course, one life lost is a frightful thing. Going over a period from 1900 to 1910, the records in the supervisor inspector's office for the First district show that during the period indicated 3,730,616,085 passengers were carried, and the loss of life, from all causes, of every character, accidents, fire, collisions, everything else, was one life in 1,119,969 passengers carried. For the Second district, which comprises the harbors of New York, Boston, Philadelphia, New London, Albany, Portland, Providence, Bangor, Me., New Haven, Conn., for that period from 1900 to 1910, and this district takes in the frightful loss of life in the case of the General Slocum and also the loss of life due to the sinking of the Larchmont up in the sound, the government records show that over 2,960,432,640 passengers were carried and the loss of life was one in 1,905,807 passengers carried.

Mr. Bishop's own company states that in the 30 seasons that they have run their vessels they have carried over 60,000,000 passengers. This company operates the Grand Republic, referred to in Mr. Donnelly's paper. Mr. Bishop says: "In 30 seasons we have carried over 60,000,000 passengers between terminal points without the loss of one life, and this in view of the fact that in the season of 1911 alone the steamers made 2,974 trips between Coney Island and New York, 328 trips between Rockaway Beach and New York, 178 trips between New York and various groves with chartered parties and special excursionists, and about 250 trips to the fishing banks."

Warren T. Berry:—While I admire the Hudson river passenger boats and have the greatest respect for their designers, I do not think they represent the highest skill in naval architecture to which man has attained. Many of our lake and sound steamers, to say nothing of battleships, and vessels like the Lusitania and others, certainly represent indefinitely more skill on the part of the designer.

Regarding the necessity for fireproof steamers the authors state that it is "almost beyond comprehension why the problem has not received more careful consideration long before this."

If they will refer to the proceedings of this society for 1906, pages 1 to 29, on "The Construction of a Fireproof Excursion Steamer," by Mr. Gatewood, and "A Fireproof Ferryboat," by Mr. F. L. DuBosque, and the ensuing discussion, I think they will admit that the problem received considerable careful attention and consideration at that time, and I fail to find that the present paper overcomes many of the difficulties of fireproof construction advanced then, such as the discomfort to passengers and crew from heat in the summer in structures entirely of steel; the objectionable springiness of light steel decks; the additional weight and cost of steel upper works; and the troubles in connection with compass adjustment in such a structure.

The present paper contemplates a vessel of approximately the same length and beam as the steamer Grand Republic. The Grand Republic's boilers have 180 sq. ft. of grate surface and the design in discussion specifies nearly double this surface, or 352 sq. ft. Assuming vessels of the same size as to carrying capacity, will not the coal consumption be tremendously increased notwithstanding the reduction in consumption per horse power assumed in the paper?

Competition of Trolley

Cheap transportation by trolley has reduced most of the excursion business in this port to a very low standard of cost and I doubt that any material increase in the cost of operation or maintenance could be justified. If the vessel is uncomfortable or the price of transportation has to be increased to meet the requirements of larger coal bills and general maintenance, the steamer is not commercially practical.

The double hull construction shown in the midship section provides 16 in. clear space between outer and inner hulls at the side. How can this space be properly inspected, cleaned, and painted, or otherwise cared for?

It would be interesting to know the weights of the upper steel structure described in this paper. The increase in horse power from 1,400 on the Grand Republic to 3,000 seems to be considerable for a vessel of the same size and service.

The beam engines referred to in this paper at least seem to have the peculiar advantage of durability, and any one who has had experience in their operation can testify to their remarkably low cost for maintenance.

W. H. Fletcher:—We must not advise people to build, nor must we undertake to construct, something that will not pay after it is finished, due to its excessive cost.

You must consider that you can get about so much money to take a passenger from New York to Albany, and we must, in building a boat, cut our cloth to suit the job. The building of the boat and the type of engine which is used should not be considered altogether from a scientific standpoint. It is not fair, Mr. Donnelly, either to the traveling public or to the builders, or to the designers, to select the steamer Grand Republic as the typical steamer of the excursion passenger boat type of steamers in use today. For example, she is a wooden boat and her boilers are down in the hold. In the modern passenger boat of today the boilers are generally enclosed in steel cases. Electricity is another element that adds to the safety of these boats with the great wooden superstructure. The records show that we are far safer on one of these passenger steamers than in a fireproof building. We find that the fireproof building is not the safest place in the world in time of fire. There is no place wherein we run more risk from danger of fire than we do in a private house, particularly in the city of New York. I think if you will take the whole of New York city you will find that the loss of life due to fires in private residences—I mean the residences of people with means—is far greater in proportion than it is in traveling on these old wooden steamboats.

I think the General Slocum burned a little more rapidly than most other boats would, from the fact that when she first came out her joiner work, instead of being painted, was shellaced and varnished, and year after year that shellac and varnish was put on, and finally she was painted. The boat was a great, open structure, and the draft would blow through it like it would through the loft of a large building that had no partitions in it. There are thermostats in each stateroom on the night boats of both the sound and Hudson river boats. Of course, all these various installations which are designed for the safety and protection of the traveling public tend to increase the cost of construction, and we must not lose sight of the practical and commercial elements which are involved in the proposition.

I do not believe with your 3-screw propulsion on the Hudson river that you will get anything like the percentage of performance you will get out of the sidewheels, because the sidewheels seem to be the ideal thing for that particular place.

First Surface Condenser

George W. Dickie:—I am only going to say one or two words, because when I read this paper I got quite a shock. Apparently I had been boasting for a good many years about something that was not so. I thought when I was an apprentice that I had worked on the first, about the first surface condenser engine for steamboats that had been built. I am not near old enough to have done that,

if the statement in the paper is true, that the surface condenser was brought into service 25 years after the date of the Clermont. The Clermont was launched in 1807, and 25 years latter would bring us down to 1832, which was just 30 years before the time when I worked on about the first surface condenser that had been made.

Some 10 years ago I took a trip on a very fast passenger steamer, the Columbia, from Glasgow to Iona, the steamer making 24 miles an hour, side-wheel steamer, feathering wheels, engines making 44 r. p. m., oscillating 3-cylinder compound, two low pressure and one high pressure in the center. It was one of the most admirable pieces of engineering work I had ever seen. I made strict inquiries as to the consumption of fuel, and was told that it was 2.1 lb. for indicated horse power per hour, and I think it is very unfortunate that comparisons should be made in a paper like this, taking something that is exceedingly old and comparing that with the very latest, modern practice. I doubt, however, whether a three-shaft vessel operated second hand from the generator would equal that consumption I have just mentioned for the direct-acting oscillating engine. You know in Scotland the oscillating engine with the side-wheel steamer has the place there that the beam engine has here, and they have both been developed along that line to a remarkable degree of efficiency.

Charles M. Ingles:—I was one of the builders of the steamer Grand Republic, and therefore ought to know something about it. It says in the paper, referring to the engine used in the Grand Republic, "while its origin is now uncertain, it is believed to be between 50 and 60 years old." I would like to inform Mr. Donnelly that that engine came from the steamship Morro Castle, which was built about 1860, and today, if the company owning the engine wished to move it and put it in another boat, it could go on for 50 years longer.

Further than that, I would say in regard to expense, Mr. Donnelly does not tell us what the ship is going to cost. I am afraid that the cost would be such that the men in the excursion business in the port of New York would find it absolutely prohibitive. The excursion business is of short duration, and a very costly boat would not be profitable in that service.

Some Pointed Remarks

The history of the steamboats Grand Republic and Columbia is as follows: The boats cost, at the time they were built, less than $100,000, engines, boilers, and all the outfit complete. R. Cornell White managed and ran these boats for two years, when he failed. They were then sold and brought $70,000. The company which bought them and ran them for a time could not earn any money on them and they were sold, one to the Baltimore & Ohio railroad for $50,000, and the other, the Grand Republic, to the present company which operates it, for $60,000, and these same people also owned the General Slocum. The Grand Republic was then sold to the people who now own her for less than $30,000, and they are the only people who have made any money on her.

I do not see where you can add $90,000 to the cost of any vessel, and get that money back, or anything near get it back. Much emphasis is laid in the report regarding the loss of life by fire. I made the remark to a gentleman sitting near me that I have been in the business for many years, and know of only two cases of loss of life by fire on board a steamer, one was the General Slocum, and the other was the Seawanaka.

Engineering Always Changes

Anybody who has traveled around the world knows that every locality has its own kind of boats, and will use no other kind, and there is no boat anywhere in the world that is more characteristic of its locality than the side-wheel beam engine steamer as seen in New York harbor. But in engineering we must look at all sides of the case, and while marine architecture in certain localities is very conservative, engineering is essentially progressive and always changing.

The paper states that wooden vessels were not built after 1878. I disagree with that, because I built the steamer Adirondack in 1895, some years after 1878, and about the time that we built the Adirondack we built quite a number of other boats of wood. We gave up the use of wood finally, not because we objected so much to the wood, as to the fact that we could not get it and we had to go to steel. Mr. Donnelly says in the paper: "Attention is called to the detailed design for the steel deck in which very light plates are used running across the vessel, with their edges flanged and united to steel carlins. The upper surface of the plating is to be covered with canvas which makes a water-tight and weather-proof joint where the plates meet." He does not say how light or how far apart the carlins are to be. He says he will put some canvas on the deck, but I do not know how he will put it there. I did not know any one had found out how to do that. There was one steel vessel constructed in Birmingham, in which they had put down a steel deck, and they tried to put canvas on it. They sewed the canvas and then put it on the deck with glue, but the canvas only kept in position on the deck long enough for the boat to come from Europe to America. Then they put a one-quarter-in. wooden deck on top of the steel deck and fastened the canvas in the usual way. I believe that proved satisfactory.

As I say, Mr. Donnelly does not tell us anything as to the proposed cost of the vessel, and there is no information regarding the weights, and so we cannot answer any of these questions as to how much she will weigh and the probable cost. Hudson river steamers do not count for much, apparently, because the sound steamers have hotel accommodations aboard. The gentleman seems to have lost sight of the fact that there are anything but excursion steamers going up the Hudson river. We have some steamers on which we do carry a few passengers and feed them. We carry, as a matter of fact, about 2,000 tons of freight on shallow water.

The statement is made in the paper that between the time the boat lays up in the fall of the year and the following spring when she undertakes the excursion business again, she could be laid up at some little town and furnish that town with electric light and power, etc., but what will the inhabitants of that town do for the four or five months during the summer when the boat is in its regular excursion business and is not available for furnishing light to the town?

The last item in the paper goes to show that there would be a great saving in coal by the adoption of the type of vessel described, that at least $9,000 could be saved in coal. The amount of coal consumed by the Grand Republic this year for 80 days, which is her usual term of service, amounted to a total of 1,920 tons, that cost $5,760. That is the sum total of the entire cost of the coal, and how a man is going to save $9,000 out of that, I fail to discover.

A Word for the Railways

W. L. R. Emmet:—Anybody who has traveled around the world knows that every locality has its own kind of boats, and nobody has found a way of making the people of one place use the kind of boat which the people of another place have devised, and there is no boat anywhere in the world that is more characteristic of its locality than the side-wheel beam engine steamer as seen in New York harbor. But in engineering we must look at all sides of the case, and while marine architecture in certain localities is very conservative, engineering is essentially progressive and always changing.

Now, what has been said at great

length about the safety of a wooden or iron vessel is obvious to everybody. We all know that many things spoken of as dangerous are really safe as compared with the risks of our ordinary lives, but we want to consider that people go a long way to make a small improvement. They do it as a matter of sentiment and principle. I suppose that the New Haven railroad carries about 1,000,000 passengers a day and I do not remember ever having heard of one of them being burned alive. A steel car is just as difficult a thing and just as an inconvenient thing to make as a steel superstructure on a boat. Furthermore, we cannot say if we try to study it, how simple or effective the steel superstructure might be made, and I think the effort to make it ought to be treated with due respect.

As to the general type of the boats and their method of propulsion, Mr. Donnelly's statements as to the inadequate design of existing boats of this class, while they may be subject to criticism in regard to detail, are in the main certainly true.

Comparing the methods of propulsion proposed in this case, we must consider that the high-speed turbine, such as Mr. Donnelly proposes to use in this case, is a device far simpler than the reciprocating engine of any type, and turbines which would propel this vessel are not materially larger than our president's desk, and are of such proportions that two or three men could lift the top off them. They only have two wheels with two rows of buckets on each wheel, and with any one row of these four rows of buckets the ship could be run at half speed. The shafts are very large in diameter and there is nothing to the mechanism but two bearings. Such a device is very simple to repair and it requires practically no expense to operate.

Simple Uses of Electricity

I will give you an example of the simplest possible uses of electricity: The Detroit Edison Co. is operating a large sub-station out in the suburbs of Detroit, without any attendant in it. As a matter of precaution they go through the form of sending a man there to watch it function, to make sure that its automatic functions were operating correctly. The processes of starting that sub-station, synchronizing it and getting it on to the circuit, and getting it to work, are all operated from distant stations and is done directly and simply. The reason is they are using simple rotation and there is no mechanical functioning which has to be performed. Electrical functions do not need personal contact for their performances. They can be performed from a distance, and the mere closing of switches is a very, very simple matter. The ordinary electric functions performed in a hotel in connection with the annunciating systems are a thousand times more complicated than anything which it would ever be necessary to do on board ship, and the chances from trouble from one of these little devices in connection with every room in the hotel is far greater than is essentially associated with the electric machinery necessary to drive a ship.

The economy in the application of this method of propulsion to this vessel is a question, in my opinion, much more of the propelling device than of the prime mover, although I have no reason to suppose that the propelling device proposed would not be good. I could imagine that in zero weather there might be some difficulties about getting a high efficiency of propulsion, and that conditions of such a character might outweigh advantages in fuel economy incident to the better prime mover, but as to the economy of the prime mover itself, there can be no question. It will take far less steam than the reciprocating engine which would be used for such a type of vessel.

Simple Use of Electricity

I will give you an example of the simplest use of electricity: The Detroit Edison Co. is operating a large sub-station in the suburbs of Detroit, without any attendent. As a matter of precaution they go through the form of sending a man there to watch it function, to make sure that its automatic functions were operating correctly. The processes of starting that sub-station, synchronizing it and getting it on to the circuit, are all operated from distant stations.

One reason for using the side-wheels on such vessels I have always understood is the absence of vibration, the vibration of propellers being apt to shake the superstructure. I think in this boat Mr. Donnelly does not have to deal with this question so much, because it is not a boat upon which people sleep, but with three propellers of high speed I should think that would not be serious, but I personally have no knowledge as to how effective this propeller might be, and suggest it as a subject for interesting discussion.

The electric design proposed in this paper, which Mr. Donnelly has himself decided upon, is the result of experience with dredges, I understand. The method of control of the speed of the motors is one that is commonly used in various forms of application of induction motors to such things as hoists, and it is done by cutting resistance into the secondary of the motor and so slowing it down without interfering with the continuity of voltage on the driving circuit. All the methods of electric propulsion which I have proposed have involved a slowing down of the turbine, or a variation of the voltage, and a control of the speed of the vessels by the turbine. In this case it is proposed to increase the resistance in the rotor of the motor, and by slowing it slow the motor down, and bring it nearly to rest, and then reverse it and bring it up the other way, and by this means the control will be similar to the direct current control used on the Chicago fireboats, and to do this you will simply work a contact lever in the pilot house and by so doing reduce the speed of the motor and reverse it, and raise it again, so that the only action in controlling the boat will be moving that lever. That method does not give the best economy at low speed. There is certain loss due to the resistance at low speed. At high speeds it would be as economical as other methods.

The Design is Practical

Mr. Donnelly brought this design to me exactly as he stated. I approve of its practicability, it is entirely practical and perfectly so today, and the turbines would work reliably and so what he said they would do, and the electrical control would be perfectly satisfactory, and any motor speeded up or slowed down or reversed at will from the pilot house.

One other point, as to the question of auxiliaries, it is proposed to operate the principal auxiliaries by steam turbines. I think in this vessel, since you maintain a continued voltage and frequency on the prime mover that these auxiliaries should be run by motors. The use of steam turbines for such purpose is extremely wasteful of steam, whereas the motor gives you power from the prime mover at the very least loss.

S. D. McComb:—I believe that the ships here around New York harbor could be made better from a fireproof standpoint than they are. The shipbuilders around New York harbor are not doing as good work in that line as the ships on the great lakes are doing. The City of Detroit III, which was built in Detroit last year, and the new See-and-Bee, now building in Detroit, are safer, from a fire standpoint, than the boats which are made here. It is true we have steel hull boats and have steel decks, and have put entire steel engines and boiler casings all the way up, but the carlins are of wood, and there are a lot of decorations and things which are very inflammable in various parts of the boat. On the great lakes they are sprinkling their boats. The Commonwealth and Plymouth are sprinkled, but the new Hudson river night boat, now being built in Hoboken, I

understand, is not to be sprinkled. In my opinion the shipbuilders around this port could add sprinkling equipments for materially reducing the fire hazards and not increasing the cost of the boats very much. In a freight steamer, the principal danger comes from fire originating in the cargo and coal bunkers. The coal bunker fires have nearly all been due to the old coal remaining in the bottom of the bunkers and fresh coal being placed on top of it. If some system could be devised so that the coal in the bunker is completely used up, spontaneous combustion would be rare. Two or three years ago we had a fire chief at one of our meetings, and he spoke of putting a system of perforated pipes through the cargo, so that water could be pumped into the hold of the ship in case of fire. There are steam extinguishers used now, but I do not know of a case where water is used. There is an experiment going on now, in which naval architects may be interested, of installing perforated pipes to use pyrine in the hold of cargo steamers. Pyrine has done some wonderful things. The pyrine extinguishers are now installed in all of the subway trains, as it is about the only extinguisher that is a non-conductor of electricity. The pipe can be very small, and yet it would be very efficient.

Sprinkler Systems

There have been two arguments used against installing sprinkler systems and fire-fighting devices in the holds of big steamers, and one of them has been that the fire insurance underwriters or marine underwriters will not allow sufficient rebate in the premium to pay for the cost of this installation. The other is that that system complies with the law. I do not believe any good naval architect considers the steamboat inspection law as representing the highest type of construction possible. I think it would pay the shipowners as well as the naval architects to investigate the question of sprinkler systems.

Stevenson Taylor:—The difficulty with the paper which Mr. Donnelly has presented is simply this: He has made a number of statements that seem to me to be unwise, to put it as mildly as I can, and I wrote him a letter calling attention to some of these statements, and in his reply to me he felt he must stand by his opinions. If he had kept his paper strictly to the subject, without indulging in the comparison, this discussion would have been avoided, and you would have lost the experiences you have gained by the discussion, and therefore I think, after all is said and done, Mr. Donnelly is to be again thanked for that reason. I will particularly say that there is no one new thing in the paper of Mr. Donnelly.

He first refers to the steel structure of hulls, to the double bottom and double sides. The construction of a boat on the plan suggested by him, in my opinion, could not be taken care of and would have to be modified very much. The steel structure surrounding the boiler and engines is not new. The centrifugal pump that he claims is absolutely new, is now being built by a company in which I have an interest to be installed in certain vessels. The scheme of an electrically-driven boat has been discussed in the papers presented to this society by Mr. Emmet. The fireproofing construction has been discussed as far back as 1906, and, notwithstanding Mr. Donnelly's statement that it is incomprehensible that it has not received more careful consideration, I will say that it has received very careful consideration in the last 25 years to my personal knowledge, and nothing but the impracticability of constructing boats of this type for other purposes than excursion boats has kept them from having been constructed.

So, as I say, broadly speaking, there is nothing new in this paper; notwithstanding that, gentlemen, and notwithstanding the fact that excursion boats and other boats have carried for many years billions of passengers with extraordinary safety, with far greater safety than attends the people of the city of New York in traversing their streets, yet we must recognize that it is quite within the range of possibility that an excursion steamer may burn up and we should do everything we can to make the lives of passengers still safer on boats.

W. T. Donnelly:—I do not find that Mr. Fletcher made any statement that would contradict the accuracy and applicability of the principles laid down in the paper. He questions the economy of the engines. I am very well aware that very much better economy can be gotten with the feathering paddle and with a large number of revolutions, but we do not have them in the excursion fleet. I am directing this paper particularly to that class of boats, and I think that is specifically stated in the paper.

Regarding the loss of life which has been taken up, it is not a question of the number in a million—because I am one in a million—and I do not care to sacrifice my life on that account.

Cost of Operation

We as engineers are dealing with progress and development. We are dealing primarily with property to be created. Whether I will or will not be able to produce a steamboat which is really fireproof is something which remains to be seen, but if it can be produced that will be the standard construction—the fireproof construction—and it will be produced, if it can be, whether it remains for me or some one following to do it.

The second speaker, Mr. Berry, spoke of the cost of operation. The cost of operation of these boats, if we are to consider them as a power-producing plant and means of transportation, should be less. As to the matter of the greater amount of power, certainly there is a greater amount of power. If an engineer has learned anything, broadly speaking, he has learned if he has to tackle any problem which is new, that he must have plenty of power.

Tendency to Greater Investment

As to the increase in cost, there certainly would be an increase in cost, but we would never have had the modern office building if some one had not had the initiative and courage to increase the cost of construction of these buildings. There is nothing in our modern life but shows increased investment, two or three times over in many lines, and the result is economy of operation, but I think the whole tendency of modern development is towards greater investment and smaller return on the money.

As to the remarks of Mr. Wm. H. Fletcher, he stated that the cost would be too great. It is simply a matter of the cost as against the earning power. My experience with regard to the number of people traveling on these excursion boats is that at the present time the excursion bsiness is confined to a very limited class of people who use these boats. There is a vast population in this neighborhood that I believe would take advantage of the summer excursion pleasure trips if the same attractive features that they find in other things were put before them in these excursion boats. That is a matter, however, entirely within the judgment of business men, and unless the judgment of business men agrees to that proposition we will not have the steamers.

Wm. H. Fletcher claims I made an unfair comparison with the Grand Republic on account of the conditions of this old steamboat. I think it is the best that could be made. It stands at the head of the summer excursion fleet in this vicinity. I did not compare it with a New York and Albany boat, or a boat of the Fall River line, because I am not in that class, and I am not attacking that class of boats at all. I can see, though, as these gentlemen say, that there will be a reflection on that class of steamers if a strictly fireproof steamer is built. That they must stand. I do not see any reason for stopping the progress of the art because the reflection will not be entirely satisfactory.

The danger is said to be very small. That is brought out repeatedly. It is not a question of the danger, or how

small it is, but it is a question—Can we make it smaller? We have made more progress in every other line, and it seems that we should, as engineers, do all we can to make progress in this line.

I was pleased to have Mr. Englis speak as he did of the construction of these boats and their cost. I think that a cost of $100,000 30 years ago would probably compare with a cost of $250,000 or more, today, as to the relative investment which would be required in these boats. In the matter of entertaining the people, my experience is that we must furnish the best that can be had, and then something better. We have built hotel after hotel in New York city, and the designers of these hotels have searched Europe for extravagant adornment for dining rooms, drawing rooms, and other rooms in the hotel, and it is not found that we have reached the limit yet. It seems to me if you are going to entertain people on the water in a steamer that some similar way of looking at the problem might have some commercial value.

Superstructure of the Boat

Mr. Ingalls has had more experience than any one else in the matter of the superstructure of these boats, and it was by an oversight that the plan showing the superstructure of the boat in question, the carlins, etc., was omitted from the paper. In my opinion, there is no question that a fireproof deck and carlin can be made. I think that will be done, but, certainly before commencing the construction of the steamboat, a full-sized sample would be constructed and tested. We will not stop short of doing that.

In the matter of saving coal, these figures given in the paper are based on the performance of the vessel at full power. The figures bear this out. I am delighted to know that the Grand Republic can be run for a season of 80 days on an output of $5,760 for coal.

Mr. Emmet has referred to the matter of machinery and the power in this vessel. I think there is no better authority as to what may be expected from electrical apparatus than Mr. Emmet. His standing in these matters is well known. As to the auxiliaries, as to whether they should be steam or electric, that is a matter of detail, which could be changed any time before the construction of such a vessel. My selection of some steam auxiliaries was with the idea of having steam for the feedwater, as is practiced in some of the land stations, of preserving enough auxiliaries under steam to furnish steam to heat the feedwater.

Charles M. Engles:—In relation to the engine of the Grand Republic, Mr. Taylor calls my attention to something which slipped my mind. The engine was originally built for the steamer Cosmopolitan, which was constructed by my father, and launched on Lake Erie in 1853. The engine was taken out of the Cosmopolitan about 1862 and put into the steamer Morro Castle, and from the Morro Castle it was put into the Grand Republic.

Andrew Fletcher:—Mr. Donnelly stated that I had not argued the question as to the modern excursion boats. When we bring the matter right down to modern excursion boats built for this New York service, the latest one is the Thomas Patten, a steel hull boat, boilers enclosed with steel casings, with an engine making between 500 and 600 ft. of piston speed, against the Grand Republic with 400 ft. of piston speed.

Conclusion of the Sessions

E. H. Peabody then read his paper entitled "Developments in Oil Burning", which was briefly discussed by Walter M. McFarland. He said that all the statements made in the paper were the product of experience, being the result of investigating mistakes which had been made in previous practice.

R. E. Gillmor then presented his paper, "The Sperry Gyro-Compass in Service", upon which there was no discussion. The paper entitled "Rudder Trials U. S. Sterrett", by Assistant Naval Constructors R. T. Hanson and J. C. Hunsaker, was then read, which was briefly discussed by Prof. William Hovgaard, saying:

"The data given in this paper I consider of great interest, for experiments on this subject are, on the whole, badly needed. The modern increase in speed and length of ships has necessitated the use of very powerful steering gear, and experiments on such bigh-speed vessels as destroyers are, therefore, of very particular value. It is to be regretted that complete turning trials, including the determination of the various elements of the turning circles, were not undertaken at the same time as the rudder experiments were made. That would have added greatly to the value of the experiments.

"Referring to page 9, the conclusion that the angle should be reduced by the full amount of the drift angle, is certainly erroneous. According to an analysis which I have made of numerous turning trials, the deduction should be much smaller than the drift angle. I agree, however, with the authors of the paper that the deduction should probably be some function of the drift angle.

"The conclusions stated on pages 11 and 12 are certainly very interesting and the numerical data are *decidedly novel*. Conclusion No. 6 points strongly in favor of placing the steering engine right aft or at least in the engine room. I never could see the advantage of placing the steering engine forward, as it requires very little looking after. I have only one point to criticize, and that is a minor one. In Appendix III, and on Fig. 8, the word *stress* is used in some cases to mean the total compressive force on a spring. The word "stress" in exact language means a force divided by an area, I would suggest that the word *load* used in other cases by the authors be used throughout so as to avoid confusion."

The concluding papers were "Logorithmic Speed Power Diagram", by Thomas M. Gunn, and "Tool Steel for the United States Navy", by Lewis Hobart Kenney, but owing to the lateness of the hour, there was no discussion upon them.

Elmer A. Sperry's paper, entitled "Active Type of Stabilizing Gyro", and E. H. Rigg's paper on "Notes on Fuel Economy as Influenced by Ship Design", will be discussed in the January MARINE REVIEW.

The sessions ended, as already stated, with the annual dinner at the Waldorf.

German Ship Building

An unusual increase in German tonnage is at present going on, and most of the large companies have an almost unprecedented number of vessels in the building. Thus the Hamburg-Amerika line, on Oct. 1, had no less than 19 ocean steamers, of an aggregate tonnage of 270,000 gross register tons in course of construction, including three fast boats, each of 50,000 tons, for the Hamburg-New York trade; further, a passenger and cargo steamer for the Panama trade of 19,000 tons, and a similar vessel, of 18,000 tons, for the La Plata trade.

The North German Lloyd has during the present year ordered 11 steamers, of an aggregate of 108,000 gross register tons, amonst them a passenger and cargo steamer of 35,000 tons, whilst at the beginning of the present year there were already on order four steamers, of an aggregate of 47,000 tons.

The Hansa Steamship Co., Bremen, had at the beginning of the year six steamers ordered, their aggregate tonnage being 54,000 tons. The Hamburg-South American Steamship Co., at the beginning of the year, had four steamers, representing 26,000 tons, on order, and up till Oct. 1 four more steamers have been ordered, their aggregate tonnage being 56,000 tons. The German-Australian Steamship Co. has 11 steamers under construction, of an aggregate of 110,000 tons; the figures for the Argo Steamship Co., Bremen, were three steamers at the beginning of 1912, and four since ordered. Most of the companies have found it necessary or expedient to increase their capital in consequence of the many new steamers ordered.

THE MARINE REVIEW

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December, 1912

Great Oversea Trade

The year which is drawing to a close has enjoyed unparalleled prosperity in oversea trade. Never since the world began has there been such an interchange of commodities between countries. The growth of this interchange was first noted in September, 1910, and to the surprise of everyone, it has continued since in an ever-growing ratio. Certainly ship owners have never enjoyed such a long continued season of prosperity before. Cargo space is very scarce and freight has had to wait on the docks for weeks for lack of vessel tonnage. Ship owners have tried to meet the demand by liberal orders to shipbuilders, but ships are not built in a day, and apparently they cannot be created fast enough to meet the demand.

The shipyards of Great Britain have on the stocks or under order 505 merchant vessels of 1,846,830 tons gross, and many of the shipbuilders have had to refuse orders on account of their inability to make early delivery. Ship owners are obviously anxious to take advantage of the excellent freight rates prevailing which are in fact three times what they were two years ago and are complaining that their new tonnage has not been put into the water as rapidly as it should. However, the shipbuilders are doing all that they can and are fabricating the ships as fast as the mills can furnish the steel. The steel mills have been delayed by strikes and the shipyards in turn by a lack of sufficient number of skilled workmen.

It is clear that the productive capacity of British shipyards is not sufficiently elastic to encompass such a situation as exists at present, due undoubtedly to the control which the unions exercise over the apprentice system. It is, of course, impossible that the present pressure of cargo capacity can long continue, but it must be admitted that there is no present evidence of its coming to an early close. On the contrary, it seems probable that there will be a heavy demand for ocean transport facilities for some time to come. It seems unlikely, therefore, that there will be any material drop in freight rates in the near future and as long as ship owners can see a profit in ship-owning, even at the present increased capital cost, which is over 50 per cent greater than it was three years ago, they will continue to place new orders with the builders.

Admitting Ships' Material Free

That shipbuilding material rider in the Panama canal act has certainly provoked a great deal of discussion since the act was passed. If little thought was expended upon it before it was inserted, a great deal has been expended since. It has taken the treasury department at least three months to make up its mind what it means and meanwhile it has disturbed business everywhere. The shipbuilders were inclined to look favorably upon it until they discovered that under the interpretation which the treasury department intended to place upon the measure whole ships could be imported free with engines, boilers and auxiliary machinery complete. This put quite another light upon the matter and the president himself became somewhat alarmed.

At the recent meeting of the Society of Naval Architects and Marine Engineers at New York the subject was freely discussed and it was deemed advisable that the administration should have some technical advice on the subject. The interpretation as originally formulated would wipe out the shipbuilding industry in the United States. As it is, the interpretation which has been put upon it and issued to the customs office is broad enough. Shipbuilders feared that structural materials finished and ready to be assembled in the ship could be imported under the clause, but the treasury department has ruled that such material may be imported free provided it has been purchased in the open market and not constructed or fabricated upon a special order or after a special design. This, of course, while admitting ship plates, prevents the importation of a ship in a knocked-down condition.

Machinery, including all the propelling mechanism, and also auxiliary machinery permanently incorporated in the hull of the vessel, such as pumps, steering gear, lighting plants, refrigerating plants, steam winches, hoisting engines, generators, motors, condensers, feed water heaters, exaporators, switchboard, etc., will not be admitted free of duty, nor will consumable goods such as provisions, wine, coal and medicines.

Under the term "outfit and equipment" appropriate for the navigation, operation or maintenance of a ves-

sel and not permanently incorporated in its hull or machinery, are included such things as anchors, chains, cables, tackle, boats, repair parts, life-saving apparatus, wireless telegraph apparatus, nautical instruments, searchlights, signal lights, lamps, furniture, carpets, table linen, tableware, bedding, arms and ammunitions. All these may be imported free, not only for original equipment, but for renewal or replacement. Nuts, screws, bolts, steel plates, ships' knees, flooring and other things which, though complete articles in themselves, are useful as parts in the construction of the whole ship, may be imported free. Raw materials, such as pig iron and lumber, to be worked up into the finished state for hull or machinery, and rough forgings and castings, but not finished ones, may be imported free.

Neither materials for the construction or the repair of vessels or of their machinery nor articles for outfit and equipment will be admitted free of duty when imported to be kept in stock for sale, but they may remain in the warehouse for three years and upon withdrawal within that time will be entitled to free entry.

Application for the free entry of materials to be used in the condition in which imported shall be made to the collector of customs at the port of importation, but they may be used in another customs district upon transfer of entry papers. It would seem as though this legislation was making a lot of work for the customs department in tracing the eventual use to which the articles are put.

The point that impresses one most is that it is utterly unnecessary legislation. It had no part at all in the Panama canal act and appears to have been put in as a counter to the legislation incorporated also in the same act permitting foreign-built ships less than five years old to be purchased by American citizens and to be operated under the American flag in the foreign trade. This provision admitting foreign-built tonnage is more important than appears at first glance. In fact, since the present century began, it is estimated that more than $30,000,000 have been spent for ships flying the American flag engaged in foreign trade.

Lake Season of 1912

The 1912 lake season is over. In many respects it was the best that the lakes have ever enjoyed. More freight was moved than has ever been moved before and practically every vessel found employment, showing that the trade has fairly well assimilated the surplus of ships that existed even as late as two years ago. It must be borne in mind, however, that the elements themselves contributed somewhat to this absorption and there were long periods in which the fleet was delayed by fog.

The season of 1913 promises to be even better. If nothing unforeseen occurs, it will be better, and leading shippers are already getting into a state of preparedness for it. The movement of freight during 1912 was practically confined to the period from May 1 to Nov. 30, very little being moved during April. It looks now, however, as though should weather conditions favor, the fleet will start as early as possible next spring, and one may therefore expect a fairly heavy April movement.

Next season will open upon a rising market and it is therefore likely that vessel owners will obtain a better freight rate in the dominant trade of the lakes than they did during 1912. Ore prices have advanced in sympathy with the increased selling price of iron ore and the whole iron industry has been placed upon a basis where it may confidently expect to make a little money. It is well known that there has not been much money made in the iron business during the past three years, neither in mining the ore, nor in transporting it on the lakes, nor in smelting it into pig iron. The iron mining companies and the merchant furnaces are now assured of a reasonable profit and undoubtedly it will also extend to the transportation end. Freight carrying charges will be at least 5 cents higher than they were during 1912, and may be even 10 cents higher.

The lake trade has been handled very smoothly and no trouble has been experienced with labor anywhere. The wages have been the highest ever paid and creature comforts all that any man may reasonably expect.

There is, however, pending before the senate a bill known as the Wilson Seamen's bill, which if passed in its present form, will create a great deal of trouble. Its provisions are not at all adaptable to lake conditions, though it applies to the lakes as well as to the ocean. Navigation on the great lakes is unlike deep sea navigation owing to mere physical characteristics. Lake vessels are rarely ever out of sight of land and are touching port every day or two. There exists no necessity on the lakes for paying the men off every time the vessel touches port. They are paid either by the month or at the end of each round trip, and it is certainly imperative that they should be required to make a round trip, otherwise the vessel might be left short-handed at an upper lake dock. Nor is there any necessity for three watches, which would add 40 per cent to the crew numerically without increasing its efficiency a particle. Representatives of the Lake Carriers' Association have visited Washington in the endeavor to have some of the provisions of this bill modified, and it is to be hoped that they will be successful. Legislation of this character should be drawn by men familiar with actual conditions.

The bill, if passed in its present form, would increase the crews of lake freighters by 33 per cent by putting them on eight-hour shifts. That proposition is really absurd, as none of the crew is ever overworked. Moreover it would be impossible to accommodate them on the average freighter without building additional deck houses.

Obituary

Clement A. Griscom, for many years one of the leading figures in American maritime affairs, died at Haverford, Pa., on Nov. 10, at the age of 72 years. He began his commercial career with the shipping firm of Peter Wright & Sons, being admitted to partnership six years later. In 1871 he became one of the founders of the International Navigation Co. through his direct negotiations with the late King Leopold, of Belgium, and was elected vice president, becoming president in 1888. After absorbing the Red Star Line the company acquired the Inman Line, renaming it the American Line. He built the St. Paul and St. Louis, at Philadelphia, and purchased the New York and Paris abroad, congress at his instigation passing an act allowing American register to foreign-built ships, provided ships of equivalent tonnage were built in the United States. Mr. Griscom was associated with J. Pierpont Morgan in the formation of the International Mercantile Marine Co., which took over Mr. Griscom's companies as well as the White Star Line, the Atlantic Transport Line, the Leyland Line and the Dominion Line. Mr. Griscom served as president of the International Mercantile Marine Co. until 1904, when he resigned to become chairman of the board of directors. Mr. Griscom was one of the founders and the first president of the American Society of Naval Architects and Marine Engineers. He was a director of the United States Steel Corporation and Pennsylvania railroad and was connected with more than a score of financial institutions.

Gustav H. Schwab, head of the firm of Oelrichs & Co., general agents for the North German Lloyd Steamship Co., died at Litchfield, Conn., Nov. 12. He withdrew from the active management of the line in November, 1910, following a general breakdown due to overwork. He was born on May 20, 1851, in New York City, and was educated in this country and Germany. He entered the firm of Oelrichs & Co. on July 1, 1876, and was extremely active in both private and public affairs until his retirement two years ago.

Sir Christopher Furness, of the firm of Furness, Withy & Co. and of the Furness Line of steamers, died on Nov. 10 at London. He was born at West Hartlepool April 23, 1852, and had persued an enormously active life. It is said of him that had he lived in the United States with its great latent resources, he would have belonged in the Morgan or Rockefeller group. He served in Parliament from 1891 to 1895 and again from 1900 to 1910. He was knighted in 1895 and was created first baron of Grantley in 1910. One of the latest efforts of his life was to endeavor to place his vast works upon a profit-sharing basis, but was compelled to abandon it after a consistent effort, owing to the indifference of those who would have been the chief beneficiaries.

Capt. Orville W. Green, one of the veteran vessel masters of the lakes, died at Los Angeles on Nov. 28. He retired about eight years ago. His last command was the steamer Arthur Orr, then owned by the Elphicke Steamship Co., of Chicago. Death was due to infirmity attendant on old age.

Capt. George F. Cleveland died at his home, 14074 Euclid avenue, East Cleveland, O., of old age. He was one of the charter members of the Ship Masters' Association, and had a long and honorable career on the lakes.

Capt. Philip Carl Meyer died in a hospital at Sandusky on Nov. 15. He began sailing on the old American Eagle running from Sandusky to the Islands, but during the past 10 years had been in the employ of the Gilchrist Transportation Co., Cleveland.

Close of Lake Season

Iron ore shipments during November were 4,072,674 gross tons as against 2,523,253 gross tons during November, 1911, an increase of 1,594,421 gross tons. The movement for November, however, is not a record as it is exceeded by the November movements of 1907 and 1909. During November 1907 the fleet moved 4,156,076 tons and during November, 1909, 4,899,220 tons. The November movement during 1912 therefore shows a considerable falling off from that of 1909. The reason is that leading shippers, notably the Pittsburgh Steamship Co. and the Cleveland-Cliffs Iron Co., practically closed their ore shipping season on Nov. 23, sending forward, in fact, very little ore after Nov. 15. During December only three small cargoes were shipped, totaling 14,579 tons, making the total movement by lake for the year 47,435,777 tons, an increase of 15,305,366 tons over the movement of 1911.

The close of the lake season has been very gratifying from the vessel owner's standpoint. While practically all of the ore was moved at a reduction of 5 cents over last season's carrying charges, netting only 40 cents to the ship from the head of the lakes, the grain and coal cargoes during the fall months were carried at quite a stiff advance over the usual rate, and a number of vessels were enabled to recoup their financial losses. In fact, some of them probably made sufficient on the last trip to pay interest on bonds. It is now expected that 1913 will be even better than 1912. Furnace men entered the market very early to cover their ore requirements for next year. In fact, they were liveral buyers before ore shipments ceased during the present year and it looks now as though the leading shippers would open navigation as early as possible in the spring. Few of them for that reason are taking coal for winter storage. Iron ore prices for 1913 delivery are from 55 to 65 cents a ton higher than 1912 prices, and are therefore only 10 cents lower than the 1911 prices. The guarantee of iron content remains the same, 51.50 for non-Bessemer and 55 for Bessemer.

In sympathy with an increase in the price of iron ore, which is justified by the sharp advance in the price of pig iron, will undoubtedly come an increase in the freight rate. It is already admitted that the increase will be at least 5 cents, but vessel owners feel that they are entitled to 10 cents. The great increase in the movement of 1912 over 1911 shows with what ease the lake fleet can handle a trade that fluctuates within such wide limits. The movement of ore was really confined to the period from May 1 to Nov. 30, as only 204,042 tons of ore were shipped during April last. From June to October inclusive shipments were over 7,000,000 tons per month, a record never before equaled. Unless something unforeseen occurs, the 1913 movement will be still heavier as the April movement will probably be quite heavy.

Following were the shipments by ports:

Port.	Nov., 1911.	Nov., 1912.
Escanaba	513,790	560,328
Marquette	244 135	214.431
Ashland	168,909	414.224
Superior	800,531	1,140.767
Duluth	476,563	1,080,066
Two Harbors	514,325	662,858
	2,523,253	4.072,674
1912 increase		1,549,421

Port.	Dec., 1911.	Dec., 1912.
Escanaba	.....	10.428
Two Harbors	.....	4.151
	.....	14,579

Port.	Season 1911.	Season 1912.
Escanaba	4,278,445	5,234,655
Marquette	2,200,380	3.296,761
Ashland	2,429,290	4,797 101
Superior	9.920.490	14 240,714
Duluth	6.934,269	10,495,577
Two Harbors	6,367,537	9,370,969
	32,130,411	47.435,777
1912 increase		15,305,366

Wilson Seamen's Bill

The senate sub-committee on commerce is now giving consideration to the so-called Wilson Seamen's bill, which passed the house at the last session. This bill is fathered by the Seamen's union and is most unreasonable in many of its provisions. The bill purports to prevent unskilled manning of American vessels, to encourage the training of boys for the merchant marine and to protect life at sea by requiring full crews with proper shifts. The American merchant marine in so far as deep sea navigation is concerned, operates at present under considerable disadvantage in competition with the ships of other nations owing to the regulations governing wages, food and area of living quarters. The Wilson bill makes the conditions even more onerous. For instance, a vessel sailing under the American flag would be required to carry a crew of 32 as against a crew of 24 on a similar vessel sailing under the British flag. The measure is made to include both deep sea sailing and lake navigation, though the two are as opposite as the poles. It is impossible to make a measure common to the lakes and the ocean, owing to mere physical differences. There is no occasion for increasing the crew one-third on lake freighters, and moreover, they could not be accommodated without building extra deck houses.

Representatives of the Lake Carriers' Association have attended the hearings in Washington to point out these differences and have met with many provoking experiences. The representatives of the unions present have made a number of preposterous statements to the committee. For instance, Victor A. Olander, secretary of the Lake Seamen's union, testified that lake vessel owners compelled their crews to work 18 hours a day while the vessels were being loaded and unloaded. Vessels are dispatched very quickly at loading and unloading docks these days, and no member of the crew is expected to work beyond his watch.

Patrick Lynch, of the Firemen's union, possesses an even more vivid imagination. He testified that firemen were carried from the fire-room on lake vessels in a fainting condition, owing to overwork and unbearable heat. It would be well if the inland members of the committee on commerce could be taken on a trip on a lake freighter. They would doubtless be much amused over the hardships complained of. The stokeholds of modern freighters are very roomy affairs and the ventilation is perfect. The whole lake fleet has practically been reconstructed during the past 10 years, and living conditions aboard them are far more comfortable and sanitary than the average dwelling. As far as being too hot, firemen have been known to leave the stokeholds to go into the engine room to get warm.

The bill seeks to have crews paid off when the vessel reaches port. Obviously lake vessel owners are desirous that their crews shall sign for a round trip.

Withdrawing Sale of Fuel Oil

W. R. Haynie, American representative of Carels-Freres of Ghent, Belgium, manufacturer of the Carels-Diesel engine, says that by actual test a Diesel-engined ship can pay seven cents a gallon for oil as compared with $2.50 per ton for coal in a steamer and yet show a net saving to the shipowner, due to economy in cargo space and saving in labor. He does not seem to think that the decision of the Standard Oil Co. to cease the sale of fuel oil after Dec. 1 will especially affect the Diesel engine. Upon this subject he says:

"The average American concern, either manufacturing or transportation, has found available a large supply of either coal or oil for fuel to such an extent that the idea of saving this product does not seem to have occurred to them at all. Many of our best engineers have continued to recommend the installation of types of plants that would show great saving in fuel consumption, but the custom or habit of the American has almost become fixed 'that when the fuel comes easy they burn it wastefully,' just the same as is their attitude towards money, that 'where they make money easy they spend it wastefully.' This is not found to be the case in European countries, where they save every possible product whether it be fuel or otherwise. The European manufacturers are charged up by the United States manufacturers as being difficult competitors, due to their low cost of production, and this low cost is not all due to the low priced labor, but largely to economical methods applied in their manufacturing plants, one of them being a saving of fuel costs in developing their power and heat, as, for instance, they briquette all of their soft coal, thus preventing even the winds from wasting any of the coal dust.

"In the United States, where we have the greatest source of supply of oil in the world, and where consumption is rapidly increasing, the question arises as to why not conservate the use of oil by the application or economical methods.

"The new type oil engine is recognized in Europe as a standard prime mover both for land and sea service. It requires the use of from one-quarter to one-third of the volume of oil that a steam engine demands in order to deliver the equivalent energy. The largest shipping concerns, such as the Hamburg-American, Hansa Lines, the East Asiatic, the Furness, Withy, the United Steamship Co., and all of the admiralties are adopting the use of this type of engine, due to its economy in fuel consumption. Why not adopt a method of using oil in the manufacturing plants that will require only from one-quarter to one-third of the volume that is required at the present time by burning this oil under boilers to evaporate water into steam to be used in steam engines, etc. This would tend to lessen the cost of the fuel as also to cheapen the costs of the several manufactured products and give the manufacturers a better control of the available supply of oil in the United States."

Diesel Engine Not Affected

Editor MARINE REVIEW:—Replying to yours of Nov. 27, it is not our understanding that the Standard Oil Co. is withdrawing fuel oil from sale altogether, but that they will refuse to make long-time contracts for deliveries at a fixed price.

We are assured that the Diesel engine will not, in this connection, be affected. The fuel oil affected by their order, as we understand it, is a grade of oil for which they have been getting very much less, under contract, than has been paid right along by operators of Diesel engines. The Diesel uses any grade of fuel oil. We can use crude, if they will let us have it, or we can use the residues from oil refining, which is not known to the trade as a fuel oil at all.

Moreover, we have some plants that are running on tar oils, or gas oils, whichever you please to call it, residual from the coking of coal. The kind of oil a Diesel uses for fuel is not required to be of a certain grade, as is necessary for other kinds of oil, or so-called "oil" engines. The fuel for the Diesel requires no pre-heating, gasifying or vaporization, but is discharged into the cylinder of the engine in its raw state, the only thing done to it being to atomize it or divide it into a fine spray. Upon be-

ing discharged into the cylinder of the engine, the oil takes fire from the heat caused by previous high compression of air therein and burns gradually, resulting in smooth and even pressures, more like those of a steam engine than the explosive pressures of other kinds of internal combustion engines.

So you see we are not worried by the recent move of Standard Oil and have noticed little appreciable advance in the price of oil fuels for Diesel engines, and you may be sure we would have heard from it, had there been much advance, for we have now over 150 plants wherein we have installed Diesel engines in various lines of industry throughout our United States, an aggregate of more than 60,000 H. P.

As a matter of fact, the more gasoline, kerosene and lighter oils there is demand for, the more residues there will be as fuel for Diesel engines. Any way the proposition works, as we see it, we will be better off.

BUSCH-SULZER BROS. DIESEL ENGINE CO.
St. Louis, Mo., Nov. 29.

Seats in Lifeboats

Editor MARINE REVIEW:—In the current number of the MARINE REVIEW I note that in one of the editorials you remark that the Toyo Kisen Kaisha are giving coupons for seats in lifeboats with each ticket. I do not think that there is any especial novelty in that, inasmuch as when I crossed somewhat over 10 years ago from San Francisco to Yokohama I found a notice in my room to the effect that in case of trouble I was expected to stand by boat No. (whatever it may have been). Twice on the voyage boat or fire drills were held and were excellently carried out in the way of speed and discipline. We passengers entered into the spirit of the drill and took our stations near our respective boats.

I freely grant that your contention about the "high side" would make it a bit hard in time of actual disaster; still why could that not be obviated by some such scheme as Capt. Randall, of the American Line, advocated some years ago? If I remember it rightly it was to provide a species of railway athwartships to carry boats from one side to the other so that either set of davits could be used.

In the case of the Titanic, everything was favorable for getting boats off. Had any sort of breeze been on I greatly doubt if many of the boats would have survived even had they been properly launched.

It is as you say, that it is now a question of bulkheads being properly carried up and properly built to withstand any head of water they may be called upon to stand, rather than a question of boats.

I crossed on a steamer once—she has since been lost—and remarked the fact that the supposedly watertight door between her engine room and fire room was not watertight at all for the light of the fires could be easily seen through the side. From the engine room forward for two firerooms, if I remember rightly, there was no watertight division. This ship stayed afloat for about 12 hours after the accident, but finally the bulkhead gave way under strain.

I have crossed the Atlantic many times in ships of various lines, but never yet have I seen a boat or fire drill and in some cases the boats were, or looked to be, stuck to their chocks by paint.

Given proper bulkhead construction and proper drills for boats—with enough boats for more than all—there is no reason why any serious disaster might happen. Personally, if I knew a ship to have decent bulkheads I would rather stick to her than take to the boats, and that is what I believe a great many people on the Titanic did, thinking that it was impossible for her to sink.

By the way, I saw a boat drill on an English ship as I was coming up the Red Sea once and I may add that it was so slowly done that the old tub would have plenty of time to sink before the boats were provisioned. In theory the work was excellent; but the practice was rotten.

I would not take the T. K. K. too much to task about their idea. In the first place they do not carry a superabundance of passengers, either first or second. I am not positive but I do not think that any of their boats of the Tenyo class ever carry more than 200 of both classes at the outside and certainly not very many more coolies.

Had it not been for the innate chivalry of men a great many more could have been saved from the Titanic.

Personally I think the T. K. K. scheme is good—provided they still have their drills—for when a passenger knows what boat he belongs to and takes an interest in his drill when the time of emergency arises, there is liable to be far less panic.

Very truly yours,
CHAS. G. FITZGERALD.

Esperanza Garrison P. O., Md.,
Nov. 30.

Description of New Buffalo Steamer

Editor MARINE REVIEW:—I wish to congratulate you upon your November number. The details of the new Cleveland & Buffalo passenger steamer are most complete and their liberality most unusual, particularly with regard to the machinery installation.

The designer of these engines is also deserving of high praise; they exhibit not only a grasp of the importance of the unit but an eye to symmetry and an attention to detail that is extremely satisfying.

The perspective view at the head of the article exhibits the usual exaggeration which artists without the nautical instinct or training almost invariably display, but the saddest feature is that such a splendid piece of work should be handicapped by such a ridiculous name.

It is a little difficult for those who dwell by the salt water to realize that the biggest thing of her type is to be found on the great lakes, but we are gradually becoming accustomed to surprises from that section. I am,

Very truly yours,
17 Battery place, BRINE.
New York, Nov. 20, 1912.

October Ore Receipts

Ore shipments during October were 7,010,219 tons, of which 5,913,493 tons went to Lake Erie ports, distributed as follows:

Port.	October, 1912.
Buffalo	906 541
Erie	177,685
Conneaut	1,056.775
Ashtabula	1,234,953
Fairport	278,231
Cleveland	1,221,572
Lorain	622 790
Huron	76,177
Sandusky	.....
Toledo	287,511
Detroit	51,258
Total	5,913,493

Lake Erie Ore Receipts

Ore shipments during November were 4,072,674 tons, and during December, 14,579 tons, of which total, 3,811,530 tons went to Lake Erie ports, distributed as follows:

Port.	Nov., 1912.
Buffalo	630,011
Erie	103.429
Conneaut	574,056
Ashtabula	799,848
Fairport	138,957
Cleveland	800,022
Lorain	263,054
Huron	58 215
Sandusky	.....
Toledo	242,167
Detroit	67,441
Total	3,677,200

Port.	Dec., 1912.
Buffalo	20 486
Cleveland	79,926
Ashtabula	22 829
Lorain	4,634
Toledo	6,455
Total	134,330

Accidents to Lake Vessels

Nineteen Vessels Became Total Losses on the Great Lakes During 1912—The List

DURING 1912 a number of vessels ended their existence on the great lakes, nineteen vessels being either total losses or constructive total losses. The most important loss was that of the steamer James Gayley, which was sunk in collision with the steamer Rensselaer on Lake Superior, the combined loss of ship and cargo being about $300,000.

The first total loss of the season was that of the tug Charles A. Trinter, which was totally destroyed by fire at Vermilion on April 25. The Canadian steamer Iona, coal laden, took fire on Lake Ontario on May 20, and burned to the water's edge, the crew escaping in life boats. The little steamer Joseph C. Suit was accidentally hit by the steamer City of Detroit III while making dock and was sunk. The Canadian steamer Bothnia was sunk in St. Clair river in collision with the steamer S. S. Curry on June 26, being practically cut in two when the Curry sheered into her through a disabled rudder. The steamer Sydney C. McLouth was destroyed by fire on Green Bay on June 28. The steamer Viking ran ashore at Split Rock, Lake Superior, and was abandoned to the underwriters. The steamer Columbia, of Niagara Falls was badly damaged by fire on July 5 at Ogdensburg, becoming a total loss.

The great activity that was exhibited in lake trade during the year caused a number of old craft to be placed in commission that were certainly not safe carriers of iron ore in heavy weather. One of these, the Culligan, formerly the George T. Hope, foundered on Lake Superior while carrying an ore cargo. The steamer S. K. Martin sprang a leak off Harbor Creek, Lake Erie, on Oct. 12, the crew reaching shore in the yawl boat. The fishing tug Carrie E. foundered in Lake Huron during a heavy gale on Oct. 11, the crew, however, managing to escape. The barge Marengo was also pounded to pieces off Morgan's Point, Lake Erie, in this storm.

Most Singular Accident

The Canadian steamer Keystorm met with a most singular accident, running ashore on Scow Island, St. Lawrence river, and two hours later sliding off the rocks and sinking in 400 ft. of water. On Nov. 1 the barge Locke, in tow of the steamer Juneau, sank in Lake Ontario near Port Hope. The old steamer Russell Sage was destroyed by fire on Nov. 2, while at dock. On Nov. 6 the barge Hattie Wells was swamped by heavy seas on Lake Michigan and lost. On Nov. 21 the steamer South Shore ran ashore near Point Sable, Lake Superior, during a heavy gale and was pounded to pieces. The schooner Rouse Simmons appears to have foundered in the gale on Lake Michigan on Dec. 4 with her crew of 16 hands. While the revenue cutter Tuscarora has searched the lake for her no trace of the vessel has been found.

The total losses are summarized as follows:

Vessel.	Carrying capacity, gross tons.
Tug Charles A. Trinter	....
Steamer Iona	500
Steamer Joseph C. Suit	1,350
Steamer Bothnia	1,650
Steamer Sidney C. McLouth	3,000
Steamer Viking	2,000
Steamer Columbia	2,200
Steamer James Gayley	7,500
Steamer Culligan	2,800
Steamer S. K. Martin	500
Tug Carrie E.	....
Barge Marengo	1,200
Steamer Pine Lake	700
Steamer Keystorm	3,300
Barge Locke	600
Steamer Russell Sage	1,800
Barge Hattie Wells	400
Steamer South Shore	....
Schooner Rouse Simmons	500

Were it not for the foundering of the schooner Rouse Simmons with the drowning of her crew of 16, the losses of life would not have been heavy. Five men lost their lives in the explosion on Standard Oil Barge No. 88 lying in Cuyahoga river at Cleveland. Two lives were lost by the bursting of steam pipes in the engine room of the steamer James Davidson on Lake Superior. One life was lost in the sinking of the steamer Pine Lake near Belle Isle on Oct. 21, and a sailor on the steamer Fleetwood was washed overboard while the vessel was rolling in the trough of the sea on Lake Huron. Four members of the crew of the tug Freeds were drowned as a result of being hit by the steamer Harvey D. Goulder which she was towing at the time. Four lives were also lost on the schooner Three Sisters which became waterlogged in Green bay, making a total of 33 lives.

An analysis of the more important accidents develops the fact that nearly all of them could have been avoided by the careful observance of the rules of navigation. It must be admitted, bers of the crew of the tug Freeds however, that the Great Lakes Protective Association has done a great deal to minimize this form of accident. Some of the losses were quite heavy, notably the steamer G. J. Grammer, which was sunk in collision with the steamer Northern Queen near Corsica Shoal, Lake Huron, on July 14, spending three weeks in dry dock in Cleveland after she was released. The steamer G. Watson French collided with the steamer Mataafa on Grosse Point, Lake St. Clair, on July 27, damaging the Mataafa very badly.

Following is a tabulation of accidents since Aug. 1. The list of accidents prior to that time will be found in the August MARINE REVIEW.

Date—Name of Vessel.	Nature of accident.	Location.
Aug. 2 Str. Bransford	Grounded while coming in to land some passengers; released on Aug. 3; not damaged	Mackinaw City.
Aug. 2 Str. W. M. Egan	Carried away four gates of lock 23; punctured hole in her side and broke wheel	Welland canal.
Aug. 3 Str. W. H. Truesdale	Stuck in mud and when released very suddenly crashed into bridge, moving it 10 ft. out of place. Upper part of steamer damaged	Blackwell canal, Buffalo.
..... Str. C. F. Curtis	Machinery became disabled; anchored her consorts and went back to Port Huron	Lake Huron.
Aug. 3 Str. Kensington	Hit steamer J. J. Boland; stem bent and port side damaged	Superior, Wis.
Aug. 3 Str. J. J. Boland	Hit by steamer Kensington; two plates damaged on starboard side abreast of cabin	Superior, Wis.
Aug. 7 Str. James Gayley	Collided with steamer Rensselaer and sank; total loss; crew and passengers rescued by steamer Stadacona; loss estimated at $300,000	Lake Superior.
Aug. 7 Str. Rensselaer	Collided with steamer James Gayley; bow stove in and forepeak filled with water; put into Marquette for temporary repairs and left on Aug. 10 for Cleveland where she was docked on Aug. 14; about 20 plates removed; repairs completed Aug. 24	Lake Superior.

Aug. 9	Sch. Romeo	Filled with water as she was about to start on trip and settled on bottom in shallow water	Sandusky, O.
Aug. 9	Str. H. S. Sill	Ran ashore in dense fog; released on Aug. 10 after lightering 600 tons of coal; reloaded lightered cargo; docked at Milwaukee; 46 plates damaged and heavy internal damage; three weeks out of commission	Nine Mile Point, Lake Huron.
Aug. 9	Str. B. F. Jones	Backed into a coal dock and damaged her rudder; delayed until Aug. 14 making repairs	Outer harbor, Cleveland, O.
Aug. 10	Str. Filbert	Ran ashore in dense fog; released by steamer Collingwood, uninjured	St. Mary's River.
Aug. 10	Str. Wisconsin	Ran aground; released, uninjured	Buffalo breakwater.
Aug. 16	Str. H. E. Packer	Collided with the hold gates of Lock 24; new gates installed	Welland canal.
.....	Str. J. G. Munro	Struck coming down; No. 1 starboard tank leaked; docked at Lorain on Aug. 17; 15 damaged plates; nine days making repairs	Sault river.
.....	Str. Abraham Stearn	Hit pier; temporarily repaired	Gary, Ind.
.....	Str. Malietoa	Picked up a log and damaged her wheel and rudder; repaired at Lorain	Lake Huron.
Aug. 17	Str. Leafield	Stranded on rocks; released on Aug. 28 and taken to Collingwood; docked; 20 plates damaged, 16 of which must be replaced; also will get new stem	Lonely Island, near Midland.
Aug. 18	Str. A. E. Stewart	Ran ashore in heavy weather; released on Aug. 20 after lightering 26,000 bushels of cargo; docked at Cleveland; 3 plates damaged; repairs completed Aug. 27	Sturgeon Point, Lake Erie.
Aug. 18	Tug Robert H. Hebard	Hit by steamer Edwin F. Holmes; fender strake ripped off about 4 ft. and hull somewhat damaged	Buffalo.
Aug. 18	Str. John W. Moore	Caught up long wire cable which jammed between stern bearing and hub of wheel with such force as to stop her engine, causing her to run aground	Sarnia, St. Clair river.
.....	Str. C. A. Congdon	Struck; docked at Superior Aug. 20; 90 plates taken off and about 50 frames damaged; ten days to make repairs	Lake Michigan.
Aug. 21	Derrick scow	Struck a pile and sank to the bottom	Lorain.
Aug. 21	Sand Str. Perry	Sank in 15 ft. of water when a temporary patch over a hole gave way	Black Rock harbor, Buffalo.
Aug. 22	Str. W. P. Snyder	Ran on rocky bottom right after leaving Canadian locks; released after lightering 300 tons; docked at Ashtabula; 14 plates and number of frames damaged	Sault Ste. Marie.
Aug. 26	Str. Tionesta	Ran ashore in dense fog; released on Aug. 27 after lightering; reloaded lightered cargo	Tin Shoals, Straits of Mackinac.
Aug. 26	Str. Peter Reiss	Ran ashore in thick weather; released herself uninjured	Poe's Reef, Straits of Mackinac.
Aug. 27	Bge. Holland and Bge. Fassett	Tow line parted between barges and steamer Cherokee; causing them to strand; released, uninjured	Entrance to Harbor Beach.
Aug. 28	Drill Boat No. 1	Collided with Str. St. Paul; badly damaged; docked for repairs	Entrance to Buffalo harbor.
Aug. 28	Bge. Donaldson	Sprang a leak and was beached under east breakwater	Cleveland, O.
Aug. 30	Str. Brandon	Parted wheel chain just outside of harbor and was towed into port	Buffalo harbor.
Sep. 1	Str. Wm. H. Rogers	Crossed tow line of oil tug Security and her barge in dense fog, causing barge to crash into starboard bow of Rogers; barge's anchors punched through her plates, stern twisted and port bow badly damaged; damage extended from forefoot to forecastle deck and from stem to collision bulkhead; returned to Sault for survey and then went to Superior to be docked; about three weeks' time for making repairs	Near Whitefish Point, Lake Superior.
Sep. 1	Oil tug Security	Collided with steamer Wm. H. Rogers; stern badly twisted and 13 plates damaged; docked at Cleveland Sept. 5	Near Whitefish Point, Lake Superior.
Sep. 2	Str. Clifford Moll	Jammed between lock walls and steamer Venezuela; 70 ft. of top facing of lock wall torn up	Poe locks.
Sep. 3	Str. J. K. Dimmick	Stuck in channel owing to strong current; released on Sept. 4, uninjured	Cleveland.
.....	Str. Walter Scranton	Ran aground; lightered and released on Sept. 5	Georgian Bay.
Sep. 5	Str. Thos. Shaughnessy	Damaged her steering gear and rudder coming down the river	Cleveland.
Sep. 6	Str. Minnie R.	Burned to water's edge; cause unknown; loss estimated at $10,000	Holland, Mich.
.....	Str. Britannic	Ran ashore; after two weeks of effort to release her abandoned by wreckers Sept. 7	St. Lawrence River, near Morrisburg.
Sep. 7	Str. Simon Langell	Foremast carried away by B. & O. bridge	Cleveland.
Sep. 9	Tug Lycora	Water pouring in through her dead-lights forward caused her to sink to the bottom	Cleveland.
Sep. 9	Ferry Ste. Claire	Ran aground in fog; released by a tug on Sept. 11	Peche Island.
Sep. 12	Str. Wilbert L. Smith	Ran aground in fog; released on Sept. 14 after lightering 1,000 tons of ore; leaked; docked at Toledo on Sept. 18; about three weeks to make repairs	Mission Point, Mackinac Island.
Sep. 12	Str. Amazonas	Collided with her barge Matanzas; collision caused by suction of passing steamer (Paipoonge); towing engine dragged out, tearing up most of her deck aft and damaging number of deck beams; both Matanzas and Amazonas went to Detroit for repairs	Lake St. Clair.
Sep. 14	Str. Faustin	Sank at Delray Salt Co.'s dock	
Sep. 16	Str. Frank Heffelfinger	Hit N. Y., P. & O. dock, damaging it slightly; steamer not injured	Cleveland, O.
Sep. 16	Str. F. B. Squire	In backing out of slip, stern hit opposite bank and had to be towed back to elevator, as she blocked channel; lost two days on account of accident	Chicago, Ill.
Sep. 17	Str. Norway	Struck an obstruction; after stopping for an examination proceeded on her trip	Detroit River.
.....	Str. A. McVittie	Struck a crib; damaged her forefoot and bow	Morrisburg.
Sep. 17	Str. J. C. Gilchrist	Ran aground in thick weather; released on Sept. 22 after lightering 45,000 bu. of grain; reloaded lightered cargo; not damaged.	Stag Island, St. Clair River.
Sep. 17	Str. Nottingham	Ran aground in thick weather; released on Sept. 20 after lightering about 1,000 tons of ore; not injured; reloaded lightered cargo	Stag Island, St. Clair River.
Sep. 19	Str. Harvard	Ran aground near ore dock, owing to low water; released herself	Huron, O.
.....	Str. Christopher	Hit a dock; was not damaged	Chicago, Ill.
Sep. 22	Str. Alva C. Dinkey	Lost quadrant and ran aground on Recor's Point; released on Sept. 24 and waited at St. Clair for new quadrant, shipped from Cleveland on Sept. 24	St. Clair River.
Sep. 23	Str. Nevada	Broke four gates in a lock; steamer somewhat damaged	Lachine canal.
Sep. 24	Str. Thomas Shaughnessy	Ran aground in harbor; released on Sept. 25 after lightering 1,000 tons of ore	Toledo, O.
Sep. 24	Str. George W. Peavey	Damaged her shoe and rudder; docked at Superior on Sept. 26	Duluth, Minn.

Received from Uncle Sam

WAR DEPARTMENT

OFFICE OF THE QUARTERMASTER GENERAL
WASHINGTON

Goldschmidt Thermit Co. (381551) August 30, 1912
90 West St., New York, N. Y.

Gentlemen:

1. Replying to your letter of August 26th, 1912, you are informed that the welded stern post of the steamer "Gen. Nathaniel Greene," which you repaired for this department at New London, Conn., in 1907, is still in service on that vessel and giving satisfactory results.

2. It is the general policy of this Department to not permit the publishing of any official reports upon commercial products or processes, but in this particular case there would appear to be no objection to your use of the foregoing statement of fact regarding the continued use during the past five years of the stern frame welded by you. By direction. Respectfully,

(Signed) WILLIAM E. HORTON,
Major, Quartermaster Corps, U. S. Army

We feel confident that the above letter, the original of which we can show, is enough evidence to prove the permanency of a "Thermit Weld."

Our welding process has received the sanction of the British Corporation for the Survey and Registry of Shipping, Glasgow.

Our Pamphlet No. 25-E and "Reactions" will interest you. Shall we send them?

THERMIT

GOLDSCHMIDT THERMIT COMPANY
WILLIAM C. CUNTZ, Gen. Mgr.
90 West St., New York

432-436 Folsom St., San Francisco
103 Richmond St., W., Toronto, Ont.
7300 So. Chicago Ave., Chicago.

The Babcock & Wilcox Co.

NEW YORK and LONDON

Forged Steel

Marine Water-Tube Boilers

and

Superheaters

for

Naval Vessels **Merchant Steamers**
Ferry Boats **Yachts and Dredges**

These boilers hold the record for economy, capacity and endurance in the Navies of the World.

They have shown the same characteristics in the Merchant Marine. Babcock & Wilcox Boilers and Superheaters in one vessel are *saving more than 15 per cent.* over Scotch boilers in sister vessels.

Is a reduction in your coal bill of any interest to you?

Babcock & Wilcox Boilers have all essential parts heavier than corresponding parts in Scotch boilers, giving greater security against corrosion. They are lighter, safer, easier to clean and to operate than Scotch boilers, and much more efficient.

We are constantly receiving "repeat orders" from owners of merchant vessels who have had many years' satisfaction from the earlier installations.

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INSURES QUALITY

Grades—Best, U. S. Navy, and Navy, both Spun and Unspun.

Also Plumbers' Oakum and Spun Cotton.

Give us an opportunity to show you the quality of our goods.

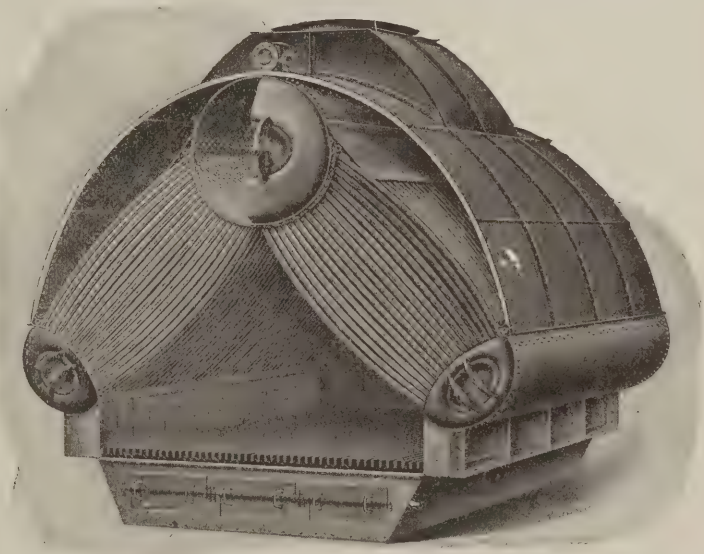
We were established in 1840, and for over 70 years have been doing a business that has been made possible only by "Square Dealing".

"Quality, First, Last, Always"
IS OUR MOTTO

Let us hear from you at once.

W. O. DAVEY & SONS
JERSEY CITY N. J.

Mosher Water Tube Boilers

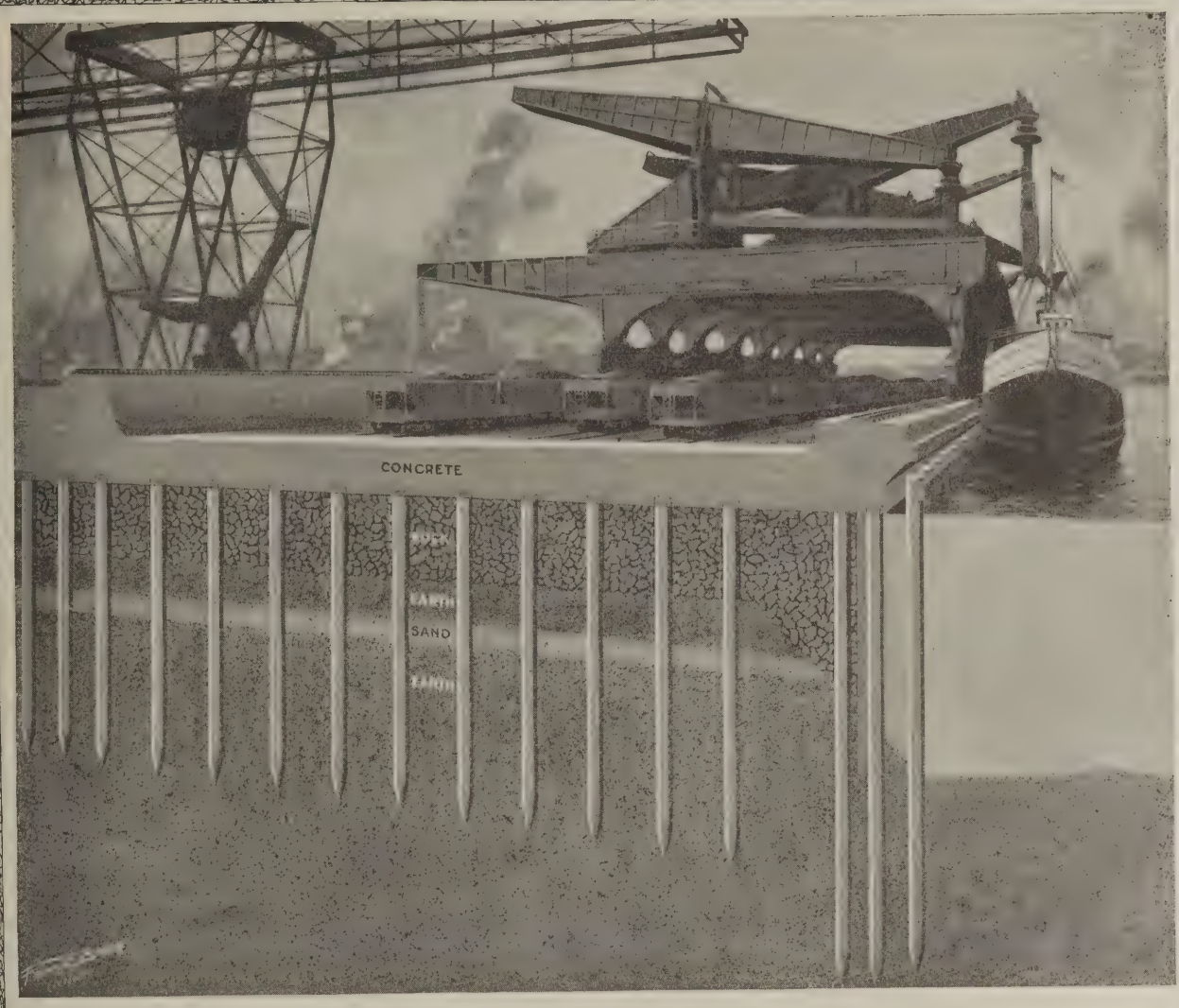


Adapted for the highest grade service, Torpedo Boats, Destroyers, Battleships, and large commercial vessels. Steam drums up to six feet in diameter, larger water and steam room capacity than any other boiler.

Any tube can be replaced without disturbing any others. Fifty tubes removed through one hand-hole. Curvature of tubes just sufficient to avoid expansion troubles. Greatest facility for cleaning interior and exterior of tubes. No screwed joints, all tubes expanded. All parts of wrought steel. Send for catalogue.

MOSHER WATER TUBE BOILER CO.
30 Church Street, NEW YORK

Sep. 25	Sch. Newell Hubbard	Sprang a leak and sank in 21 ft. of water; probably total loss	Lake Erie, near Bois Blanc Island.
Sep. 25	Bge. Montezuma	Sprang a leak in storm and was towed into Portage Lake by her steamer (Amazonas); lost her spars and was otherwise damaged; to be repaired at Houghton	Off Eagle Harbor, Lake Superior.
Sep. 25	Str. Amazon	Collided with steamer Angeline; not damaged	Lake St. Clair.
Sep. 25	Str. Angeline	Collided with steamer Amazon; not damaged	Lake St. Clair.
.....	Str. Van Vleck	Struck and damaged her rudder; picked up in disabled condition at Detour and towed to Cleveland by a tug; ran ashore on Kelley's Island Sept. 30, enroute to Cleveland	Soo River.
Sep. 27	Str. Culligan	Foundered; steamer not insured	Lake Superior.
.....	Str. Wilkesbarre	Steering gear disabled	Near Waugoshance, Straits of Mackinac.
Oct. 1	Str. W. B. Dickson	Hit abutment of a bridge and damaged four plates and eight frames; repaired at ship yard	Lorain, O.
.....	Str. Polynesia	Lost all buckets off her wheel; towed by a Canadian steamer to Alpena; left Milwaukee Oct. 9 after making repairs	Lake Huron.
Oct. 5	Str. John J. Barlum	Collided with steamer Champlain in fog; settled on bottom in shallow water; temporarily repaired at Marine City; docked at Cleveland on Oct. 8; eleven plates taken off and a number of frames damaged; repairs completed Oct. 19	St. Clair River, near Algonac.
Oct. 5	Str. Champlain	Collided with steamer John J. Barlum in fog; stem badly damaged and lost her starboard anchor, but proceeded on her way; unloaded at Buffalo and left for Ashtabula, where she was docked on Oct. 8; stem badly twisted and 14 bow plates damaged	St. Clair River, near Algonac.
Oct. 5	Str. D. Z. Norton	Struck an obstruction in dense fog, puncturing compartments No. 1, 2 and 3, and settled on bottom; released on Oct. 8; left for South Chicago on Oct. 11, where she was docked; starboard side ripped open for about 280 ft.; 48 plates damaged, 21 of which must be replaced; narrow escape from foundering in deep water. Repairs completed Nov. 2	Lake Michigan, near Sleeping Bear Point.
Oct. 6	Str. Onoko	Collided with steamer Stadacona, being hit by Stadacona's wheel; after getting out into open lake she sprang a leak and was beached at Ironwood island, of the Apostle group; released on Oct. 8 and put into Ashland for temporary repairs; sailed on Oct. 8 for Buffalo where she unloaded 21,000 bu. wet grain; docked at Lorain on Oct. 21	Duluth Harbor.
.....	Str. F. L. Robbins	Crowded out of channel by another steamer and hit a lumber dock; not damaged	Sarnia, Ont.
Oct. 8	Str. Cadillac	Struck a projection in canal wall and went to bottom; small hole in starboard side and seams opened; pumped out and floated on Oct. 9; docked at Ashtabula on Oct. 16; eight plates taken off	Welland canal.
Oct. 11	Bge. Imperial	Turned turtle and sank in 30 ft. of water; shifting of cargo of stone thought to have caused accident	Off Vote Island, Lake Superior.
Oct. 11	Str. W. P. Rend	Ran ashore in storm; released on Oct. 12 and proceeded	Near Fox Point, Lake Michigan
Oct. 11	Fish Tug Carrie E.	Foundered in heavy gale; crew rescued	Lake Huron.
Oct. 12	Str. S. K. Martin	Sprang a leak in storm and sank; crew reached shore in yawl boat; total loss	Off Harbor Creek, Lake Erie.
Oct. 12	Str. Picton	Ran ashore in fog and storm; released herself, uninjured	Morgan's Point, Lake Erie.
Oct. 12	Bge. Marengo	Ran ashore in fog and storm; tugs could not release her and she pounded to pieces; total loss	Morgan's Point, Lake Erie.
.....	Str. Geo. W. Perkins	Ran ashore in storm on rocks; floated on Oct. 16 after lightering about 3 500 tons of ore; docked at Lorain; 35 or 40 plates taken off and about 100 frames damaged; bulkhead damaged and she will get new stem	Mission Point, Mackinac Island.
Oct. 12	Str. Rensselaer	Stranded on west bank in gale; released on Oct. 15 after lightering 1,000 tons of coal; reloaded lightered cargo	Ballard's Reef, Detroit river.
Oct. 12	Str. Fleetwood	Collided with steamer Normania; big hole punctured in her bow at water line; patched up at Buffalo and left port	Buffalo harbor.
Oct. 13	Str. Thos. Maytham	Ran ashore in storm on rock bottom; released on Oct. 15 after being pumped out and left for Cleveland, where she was docked on Oct. 20; 90 plates will have to come off and tank top is damaged; will take at least 30 days to make repairs	Crab Island Reef, near Detour.
Oct. 14	Str. Benjamin Noble	Struck; leaked but proceeded; docked at Superior on Oct. 20; 54 plates damaged; will lose about 3 weeks	Near Detour.
.....	Str. E. C. Pope	Hit by tremendous wave and arrived at Manitowoc on Oct. 14 badly damaged, with bow bulwarks broken to bits	
Oct. 15	Str. Petoskey	Damaged Anchor Line dock; boat not damaged	Chicago.
Oct. 17	Str. Sinaloa	Ran aground owing to disabled steering gear; released on Oct. 18	Hay Lake.
Oct. 16	Str. Sheldon Parks	Hit by steamer J. Donaldson; few top plates damaged	Sault.
.....	Str. Jay C. Morse	Lost her starboard anchor and 45 fathoms of chain	Whitefish Bay.
Oct. 17	Str. Scottish Hero	Broke her piston rod	Sault.
Oct. 17	Tug Edward C.	Collided with tug George T. Nelles near Lake Shore bridge; the Edward C. damaged above water line	Cleveland.
.....	Str. Harvester	Hit approach to Canadian lock and damaged one plate and two frames	Sault.
Oct. 19	Bge. B. L. Pennington	Sank in 20 ft. of water while being used as a lighter to float steamer Amazonas	Niagara river.
Oct. 20	Str. Collingwood	Hit by schooner Middlesex; slightly damaged	Port Colborne.
Oct. 20	Str. Lake Shore	Ran aground in fog while trying to pass another boat; released on Oct. 20; reloaded lightered cargo and left for Cleveland	Off Russell Island, St. Clair river.
Oct. 21	Str. Pine Lake	Collided with steamer Fleetwood owing to misunderstanding of signals; Pine Lake sank; wreck will be dynamited	Lake St. Clair, near Belle Isle.
Oct. 23	Sch. Christiana	Waterlogged; lost rigging and deck load of lumber; crew taken off and schooner towed into Marinette harbor by tug	Off Green Island, Lake Mich.
Oct. 23	Str. Fleetwood	Wheel chains parted and she drifted in trough of sea; returned to Port Huron for repairs; rolled so hard that one member of crew was thrown overboard and drowned	Off Point Aux Barques, Lake Huron.
.....	Str. J. J. Boland	Grounded at entrance to harbor; released, uninjured	Buffalo.
.....	Str. W. B. Davock	Grounded at entrance to harbor; released, uninjured	Buffalo.
.....	Str. Sonoma	Grounded at entrance to harbor; released, uninjured	Buffalo.
Oct. 26	Str. Keystorm	Ran ashore on Scow Island; badly damaged and filled with water; in two hours slid off rocks and sank; total loss	St. Lawrence river.
Oct. 26	Str. Denmark	Lost bucket off her wheel; new wheel put on at Port Huron and she proceeded	Detroit river.



The construction features of this immense ore dock in the outer harbor at Cleveland mark an epoch in American dock design.

The off-shore site of the dock was covered by from 6 to 20 ft. of water. The bottom of Lake Erie at this point was soft clay. A fill made of steel-mill and railroad refuse was made to bring the grade to about 5 ft. above the level of the lake.

More than 5000 pre-molded concrete piles were driven to provide a foundation for the dock walls, the great ore-handling machines, ore piles, power house and auxiliary structures.

The soft bottom would have required a vastly greater number of timber piles. And in many places timber piles could not have been driven through the fill.

Our method of casting concrete piles vertically and curing them properly, enabled us to drive these thousands of piles with no failures.

The speed with which this work was done also is noteworthy. Construction was started on March 11, 1910, and on March 11, 1911, the ore-handling machinery was in service.

Our long and greatly varied experience on substructure work of every class enables us to meet difficult conditions such as this job presented. We are prepared to handle reinforced concrete pile work anywhere. We are in position to advise on substructure plans or to execute plans already prepared.

We are organized and equipped to do submarine and pneumatic work of all kinds, river and harbor improvements, dredging, pile driving, foundations, bridges, piers, breakwaters, lighthouses and tunnels.

We are operating in all the harbors on the Great Lakes, with offices in Chicago, Cleveland, Duluth, Sault Ste. Marie, Gary, Buffalo and Amherstburg, Ontario, Canada. Also on the New England Coast, with an office in Boston.

GREAT LAKES DREDGE & DOCK COMPANY

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.....	Str. Polynesia	Lost all buckets off her wheel; towed by a Canadian steamer to Alpena; left Milwaukee Oct. 9 after making repairs	Lake Huron.
Oct. 5	Str. John J. Barlum	Collided with steamer Champlain in fog; settled on bottom in shallow water; temporarily repaired at Marine City; docked at Cleveland on Oct. 8; eleven plates taken off and a number of frames damaged; repairs completed Oct. 19	St. Clair River, near Algonac.
Oct. 5	Str. Champlain	Collided with steamer John J. Barlum in fog; stem badly damaged and lost her starboard anchor, but proceeded on her way; unloaded at Buffalo and left for Ashtabula, where she was docked on Oct. 8; stem badly twisted and 14 bow plates damaged	St. Clair River, near Algonac.
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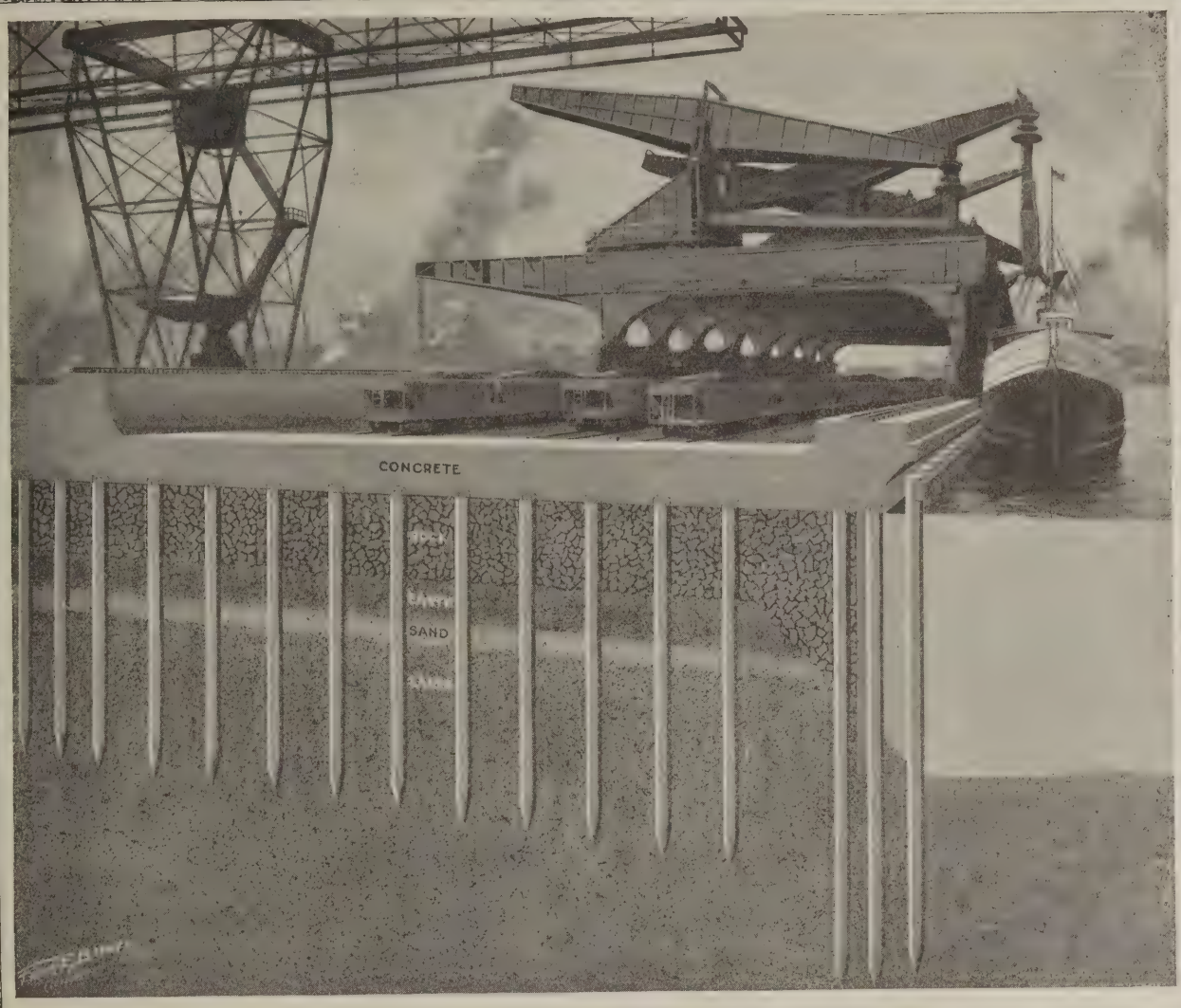
.....	Str. F. L. Robbins	Crowded out of channel by another steamer and hit a lumber dock; not damaged	Sarnia, Ont.
Oct. 8	Str. Cadillac	Struck a projection in canal wall and went to bottom; small hole in starboard side and seams opened; pumped out and floated on Oct. 9; docked at Ashtabula on Oct. 16; eight plates taken off	Welland canal.
Oct. 11	Bge. Imperial	Turned turtle and sank in 30 ft. of water; shifting of cargo of stone thought to have caused accident	Off Vote Island, Lake Superior.
Oct. 11	Str. W. P. Rend	Ran ashore in storm; released on Oct. 12 and proceeded	Near Fox Point, Lake Michigan
Oct. 11	Fish Tug Carrie E	Foundered in heavy gale; crew rescued	Lake Huron.
Oct. 12	Str. S. K. Martin	Sprang a leak in storm and sank; crew reached shore in yawl boat; total loss	Off Harbor Creek, Lake Erie.
Oct. 12	Str. Picton	Ran ashore in fog and storm; released herself, uninjured	Morgan's Point, Lake Erie.
Oct. 12	Bge. Marengo	Ran ashore in fog and storm; tugs could not release her and she pounded to pieces; total loss	Morgan's Point, Lake Erie.
.....	Str. Geo. W. Perkins	Ran ashore in storm on rocks; floated on Oct. 16 after lightering about 3 500 tons of ore; docked at Lorain; 35 or 40 plates taken off and about 100 frames damaged; bulkhead damaged and she will get new stem	Mission Point, Mackinac Island.
Oct. 12	Str. Rensselaer	Stranded on west bank in gale; released on Oct. 15 after lightering 1,000 tons of coal; reloaded lightered cargo	Ballard's Reef, Detroit river.
Oct. 12	Str. Fleetwood	Collided with steamer Normania; big hole punctured in her bow at water line; patched up at Buffalo and left port	Buffalo harbor.
Oct. 13	Str. Thos. Maytham	Ran ashore in storm on rock bottom; released on Oct. 15 after being pumped out and left for Cleveland, where she was docked on Oct. 20; 90 plates will have to come off and tank top is damaged; will take at least 30 days to make repairs	Crab Island Reef, near Detour.
Oct. 14	Str. Benjamin Noble	Struck; leaked but proceeded; docked at Superior on Oct. 20; 54 plates damaged; will lose about 3 weeks	Near Detour.
.....	Str. E. C. Pope	Hit by tremendous wave and arrived at Manitowoc on Oct. 14 badly damaged, with bow bulwarks broken to bits	
Oct. 15	Str. Petoskey	Damaged Anchor Line dock; boat not damaged	Chicago.
Oct. 17	Str. Sinaloa	Ran aground owing to disabled steering gear; released on Oct. 18	Hay Lake.
Oct. 16	Str. Sheldon Parks	Hit by steamer J. Donaldson; few top plates damaged	Sault.
.....	Str. Jay C. Morse	Lost her starboard anchor and 45 fathoms of chain	Whitefish Bay.
Oct. 17	Str. Scottish Hero	Broke her piston rod	Sault.
Oct. 17	Tug Edward C	Collided with tug George T. Nelles near Lake Shore bridge; the Edward C. damaged above water line	Cleveland.
.....	Str. Harvester	Hit approach to Canadian lock and damaged one plate and two frames	Sault.
Oct. 19	Bge. B. L. Pennington	Sank in 20 ft. of water while being used as a lighter to float steamer Amazonas	Niagara river.
Oct. 20	Str. Collingwood	Hit by schooner Middlesex; slightly damaged	Port Colborne.
Oct. 20	Str. Lake Shore	Ran aground in fog while trying to pass another boat; released on Oct. 20; reloaded lightered cargo and left for Cleveland	Off Russell Island, St. Clair river.
Oct. 21	Str. Pine Lake	Collided with steamer Fleetwood owing to misunderstanding of signals; Pine Lake sank; wreck will be dynamited	Lake St. Clair, near Belle Isle.
Oct. 23	Sch. Christiana	Waterlogged; lost rigging and deck load of lumber; crew taken off and schooner towed into Marinette harbor by tug	Off Green Island, Lake Mich.
Oct. 23	Str. Fleetwood	Wheel chains parted and she drifted in trough of sea; returned to Port Huron for repairs; rolled so hard that one member of crew was thrown overboard and drowned	Off Point Aux Barques, Lake Huron.
.....	Str. J. J. Boland	Grounded at entrance to harbor; released, uninjured	Buffalo.
.....	Str. W. B. Davock	Grounded at entrance to harbor; released, uninjured	Buffalo.
.....	Str. Sonoma	Grounded at entrance to harbor; released, uninjured	Buffalo.
Oct. 26	Str. Keystorm	Ran ashore on Scow Island; badly damaged and filled with water; in two hours slid off rocks and sank; total loss	St. Lawrence river.
Oct. 26	Str. Denmark	Lost bucket off her wheel; new wheel put on at Port Huron and she proceeded	Detroit river.



The construction features of this immense ore dock in the outer harbor at Cleveland mark an epoch in American dock design.

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.....	Str. Amazonas	Released on Oct. 30, after having been aground nearly two weeks	Niagara river.
Oct. 28	Str. J. J. H. Brown	Lost her rudder; docked at Superior Oct. 30	Off Duluth, Lake Superior.
Oct. 29	Bge. F. A. Georger	Broke away from steamer Easton in storm; crew went ashore in yawl boats; anchored near Port Colborne	Lake Erie, near Port Colborne.
Oct. 31	Str. Calgary	Ran aground at north entrance; lightered 150 tons pulpwood; released on Nov. 1, uninjured	Buffalo harbor.
Oct. 31	Str. Colonel	Hit obstruction near No. 2 coal dock, knocking a blade off her wheel	Lorain.
Nov. 1	Str. Samuel Marshall	Lock No. 13 carried away by steamer and bridge near dock knocked into canal	Welland canal.
Nov. 1	Str. W. P. Palmer	Hit east pier and damaged five plates; will make temporary repairs and finish season	Lorain.
Nov. 1	Str. Juneau	Sprang a leak and put back to Cobourg, where she sank at pier	Lake Ontario, near Port Hope.
Nov. 1	Bge. Locke	In tow of steamer Juneau when she sprang a leak; cut loose; anchor failing to hold fast; she sank; crew reached shore after perilous trip	Lake Ontario, near Port Hope.
Nov. 2	Str. Russell Sage	Destroyed by fire while at her dock, laden with lumber; not insured; total loss	
.....	Str. Port Colborne	Struck; examined at Tonawanda	St. Lawrence river.
.....	Str. George B. Leonard	Ran aground; released herself Nov. 7, uninjured	Sand Point, Lake Michigan.
Nov. 6	Bge. Hattie Wells	Swamped by heavy seas in storm and lost; crew rescued; barge and cargo (lumber) valued at $6,000	Lake Michigan.
.....	Str. Seneca	Sank a scow; two plates damaged on steamer	Chicago.
Nov. 8	Bge. Chattanooga	Pounded pretty hard in gale; sprang a leak and lost her rudder; (in tow of steamer Frontenac); towed into port by tugs; docked at Cleveland Nov. 15	Off Cleveland harbor, Lake Erie
Nov. 8	Str. Harlow	Ran aground; released on Nov. 9, uninjured	St. Clair river, near St. Clair.
.....	Str. Uranus	Ran aground; released herself	Hay Lake.
Nov. 8	Bge. Alex. Maitland	Ran aground while coming out of Erie; released on Nov. 12 after lightering about 600 tons of coal cargo; reloaded lightered cargo and sailed in tow of steamer Fitch	South Bank, near Erie.
Nov. 9	Str. Alaska	Broke her piston rod off cylinder head and damaged other parts of her machinery; towed to Soo for repairs	Hay Lake.
Nov. 10	Tug Wm. A. Freeds	Hit by steamer Harvey D. Goulder while towing her out and rolled over, drowning four of her crew	Indiana Harbor.
Nov. 10	Str. J. F. Durston	Collided with steamer J. C. Gilchrist; did not stop	Detroit river.
Nov. 10	Str. J. C. Gilchrist	Collided with steamer J. F. Durston; did not stop	Detroit river.
Nov. 11	Str. Rosedale	Ran ashore in storm; released on Nov. 12 and taken to Detour; arrived at Soo on Nov. 14, leaking badly; temporarily repaired and reloaded lightered cargo; left Soo for Port Arthur on Nov. 18, where she will be docked	Lighthouse Point, near Detour.
Nov. 11	Str. J. C. Wallace	Hit an obstruction, knocking some of buckets off her wheel; rudder spindle broken	South Chicago.
Nov. 12	Str. W. H. Mack	Crank disabled and was obliged to return to Duluth for repairs	Lake Superior.
Nov. 12	Str. Rochester	Grounded in storm; released herself on Nov. 13 and proceeded, uninjured	Whitefish Pt., Lake Superior.
Nov. 12	Str. Delos W. Cooke	Ran ashore in fog; released herself; bottom badly damaged; repairs estimated at $20,000	Lake Michigan, near Milwaukee
Nov. 13	Str. F. B. Squire	Grounded in storm; floated on Nov. 16 after lightering	Toledo, O.
.....	Str. J. L. Weeks	Ran aground in storm; not damaged; left Soo on Nov. 18 after reloading lightered cargo	Upper St. Mary's River.
.....	Str. L. L. Barth	Lost her deck load of 100,000 ft. of lumber in gale	Lake Superior.
.....	Str. Nipigon	Put in at Soo Nov. 14 leaking badly	
.....	Str. Western Star	Struck; not damaged	Calcite, Mich.
.....	Str. G. Watson French	Grounded in harbor owing to low water caused by storm; released herself on Nov. 14	Toledo, O.
Nov. 14	Tug Excelsior	Pilot-house smashed in during storm; put back into Cleveland	Lake Erie.
.....	Str. City of Mackinac II	Damaged in violent snow storm	Lake Huron.
Nov. 14	Str. Tuscarora	Lost her rudder in storm and rolled badly in trough of sea; picked up by steamer John Albright and towed to Port Huron; cargo transferred to steamer Wilkesbarre and Tuscarora left Port Huron on Nov. 23 in tow of steamer Mauch Chunk for Buffalo	Near Thunder Bay Island.
.....	Str. Collingwood	Gounded; released on Nov. 15	Abreast of Sarnia.
.....	Str. Clyde	Arrived at Duluth on Nov. 14 with loose stern bearing after storm; docked at Superior on Nov. 15	
.....	Str. Ward Ames	Struck a rock and damaged two plates	Livingstone Channel.
Nov. 17	Str. Averill	Lost her rudder; picked up by steamer Robert Wallace and towed to Cheboygan, leaving there on Nov. 27 for Buffalo for repairs	Near Mackinaw City.
Nov. 18	Str. Harvey D. Goulder	Crashed into canal wall; hole torn in her bow; six plates on starboard bow above water line damaged; three days for temporary repairs	Sault canal.
Nov. 18	Str. Milinokett	Struck end of Great Northern flour dock while entering slip in fog, considerably damaging it; misunderstanding of signals caused accident; boat not damaged	Superior, Wis.
.....	Str. E. L. Wallace	Struck in approaching channel, damaging No. 1 and 2 tanks and ten plates; docked at Toledo Nov. 21; about one week to make repairs	Livingstone channel.
.....	Str. Charles A. Weston	Struck	Buffalo harbor.
Nov. 19	Str. Sacramento	Lost her rudder; stopped at Port Huron where another was installed; left on Nov. 23 for Chicago	Near Port Huron.
.....	Str. D. W. Mills	Arrived at Duluth on Nov. 19 disabled and was docked at Superior; shoe broken	Lake Superior.
.....	Str. Choctaw	Ran aground; released on Nov. 22 after lightering about 500 tons of her cargo	Toledo, O.
Nov. 21	Str. Uganda	Broke her tiller while shifting; repaired at Superior ship yard	Great Northern Slip, Superior.
.....	Str. Keybell	Broke her high pressure cylinder and was towed to Cape Vincent	Lake Ontario.
.....	Str. South Shore	Ran ashore during violent wind storm; pounded to pieces; total loss	Near Sable Pt., Lake Superior.
.....	Str. Turret Crown	Reached the Soo on Nov. 25 with broken steering gear	
Nov. 24	Sailboat Three Sisters	Became waterlogged; four lives lost	Green bay.
Nov. 26	Str. Crete	Ran aground while coming out of Fort William; released on Nov. 28 after lightering part of cargo; reloaded lightered cargo and sailed on Nov. 28; not damaged	Fort William.
.....	Str. Arthur Orr	Damaged her rudder	
Nov. 28	Str. Northwind	Plate on port bow dented and number of rivets loosened up by striking freight dock; temporarily repaired	Duluth.

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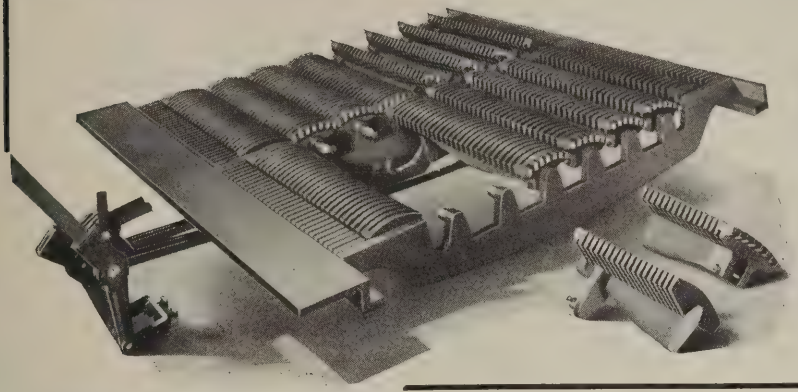

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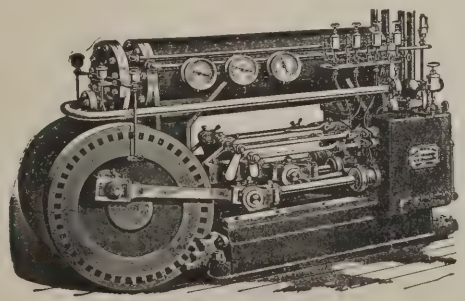

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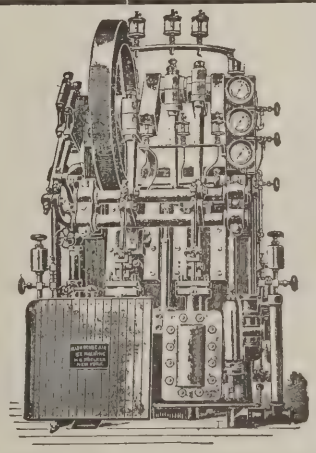

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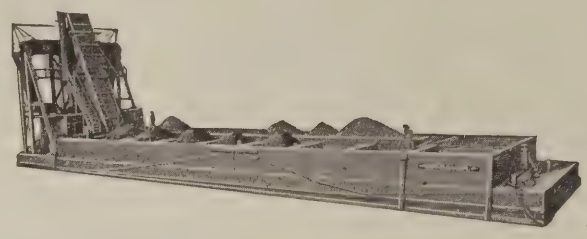

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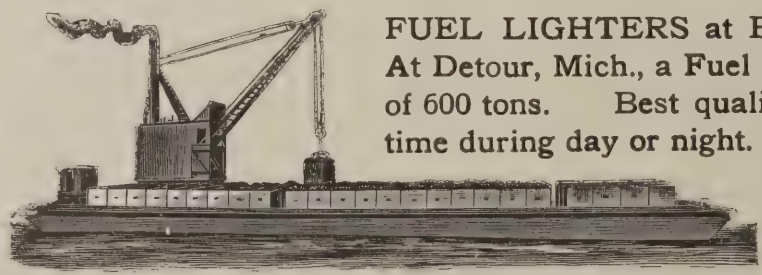

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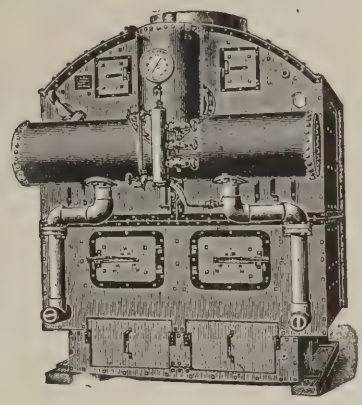

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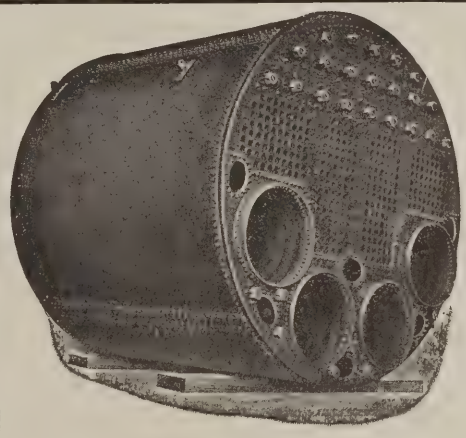

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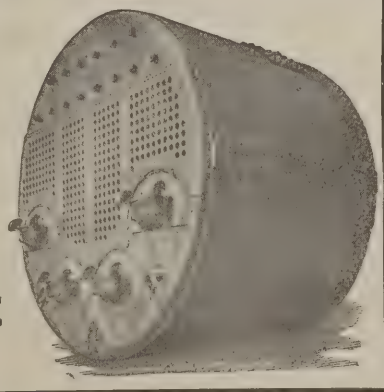

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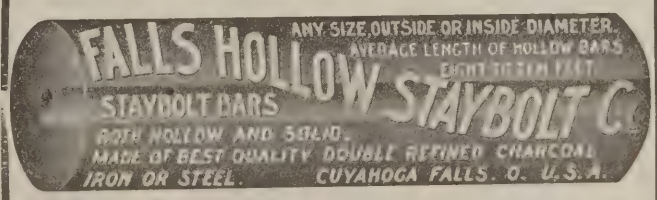
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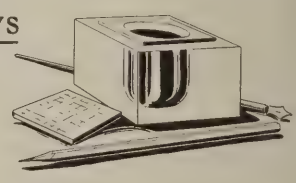

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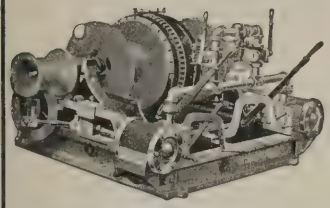

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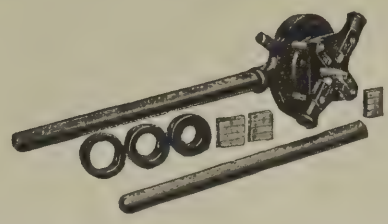

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Hyde Windlass Co..... 100
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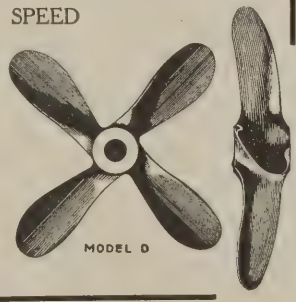

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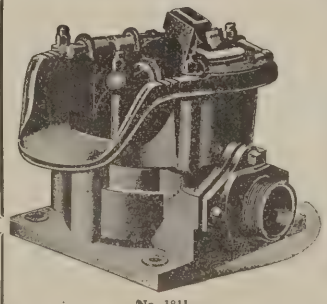
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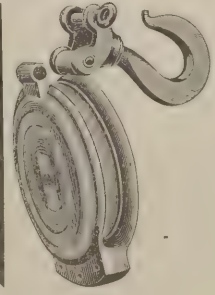

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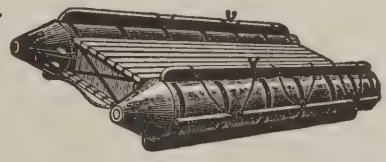

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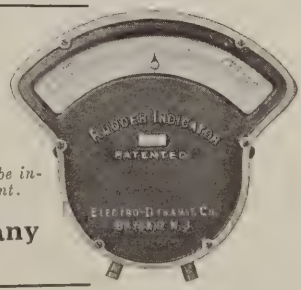

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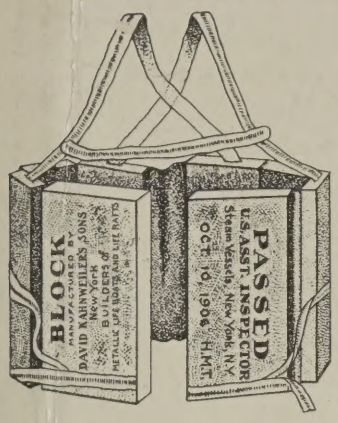

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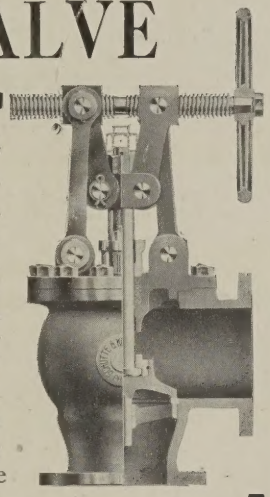

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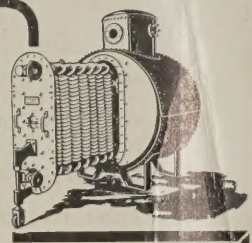

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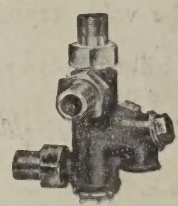

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